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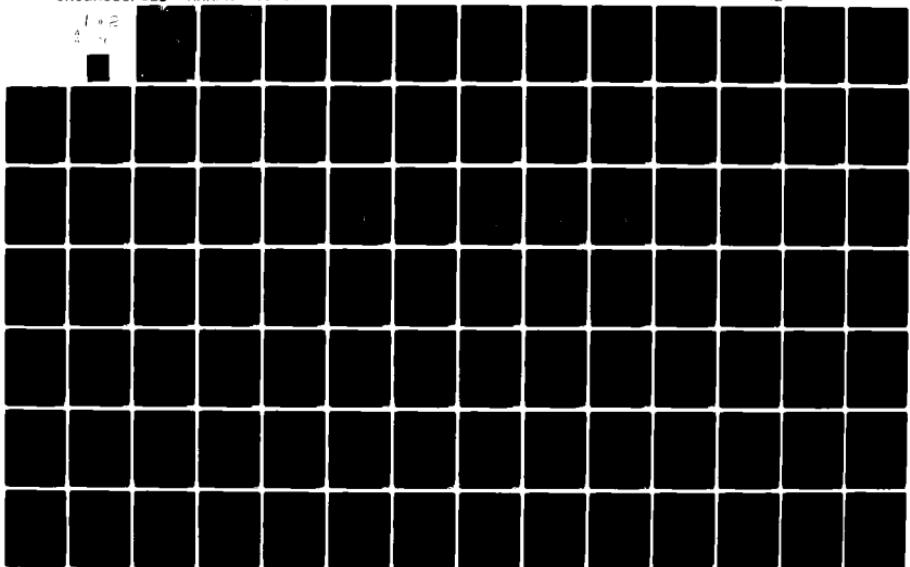
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PROPELLANT SURVEILLANCE REPORT, LGM-30 F & G STAGE I, PHASE G, --ETC(U)
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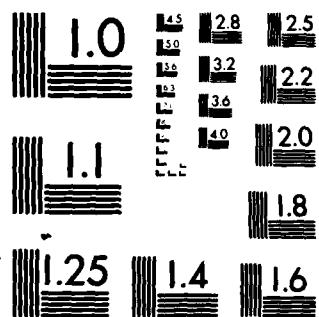
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OGDEN AIR LOGISTICS CENTER

UNITED STATES AIR FORCE

HILL AIR FORCE BASE, UTAH 84056

PROPELLANT
SURVEILLANCE REPORT
LGM-30 F&G STAGE 1
PHASE G, SERIES I
TP-H1011

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PROPELLANT ANALYSIS LABORATORY

MAKPH REPORT

445 (80)

OCTOBER 1980

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MAKPH REPORT NR 445 (80)
MMRBM PROJECT M04046C-WNL0529

PROPELLANT SURVEILLANCE REPORT
LGM-30 F & G STAGE 1 (TP-H1011)

2

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October 1980

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ABSTRACT

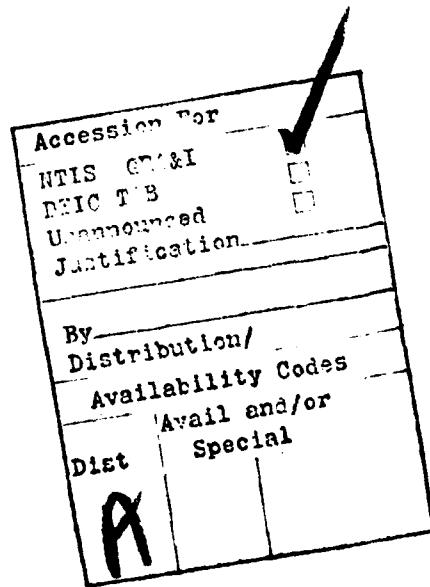
This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 F and G First Stage Minuteman Motors. This report uses a statistical approach to analyze the bulk carton propellant data. Testing was accomplished in accordance with MMWRBM Project M04046C-WNL01529.

The data from this test period are combined with data from previous testing and entered into the GO85 Computer for storage, analysis and regression analysis. From the statistical analysis of all data tested to date (fourteen and one-half years for F & G), significant degradation of the propellant does not appear likely for at least two years past the oldest data point.

Each point on the regression plot represents the mean of all samples at that particular age. The number of samples at each point is indicated on the sample size summary sheet on the page accompanying each regression plot or group of regression plots. The data range at any age can be found by suitable inquiry of the GO85 system.

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29B	Zero Time Test Results	29 Jan 64
29C	Zero Time Test Results (Supplement 1)	30 Mar 64
29D	Zero Time Test Results (Aft Closure)	9 Jun 64
29E	Zero Time (Aft Closure Supplement 1)	24 Jun 64
29F	ATP Phase I Test Results	30 Mar 65
29G	ATP Phase I Test Results	19 Aug 65
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32A	Zero Time, Wings II-V Test Results	17 Mar 65
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53	ATP Phase I, Wings II-V (Second Group)	22 Apr 66
55	ATP Phase I, Wings II-V (Third Group)	29 Apr 66
58	ATP Phase I, Wings II-V (Fourth Group)	6 May 66
61	ATP Phase I, Wings II-V (Fifth Group)	10 Jun 66
66	ATP Phase I, Wings II-V (Sixth Group)	22 Jul 66
76	ATP Phase II, Wing I Test Results	24 Jan 67
78	Zero Time, Wing VI Test Results	3 Feb 67
104	ATP Phase I, Wing VI (First Group)	12 Oct 67
118	ATP Phase II, Wings II-V (First Group)	5 Mar 68

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126	ATP Phase II, Wings II-V (Second Group)	11 Apr 68
130	ATP Phase II, Wings II-V (Third Group)	3 May 68
162	ATP Phase I, Wing VI (Second Group)	30 Sep 69
176	ATP Phase II, Wing VI (First Group)	15 Apr 70
181	ATP Phase III, Wing I	7 May 70
185	ATP Phase I, Wing VI (Third Group)	22 Jun 70
195	ATP Phase III, Wings II-V (Retest)	29 Oct 70
223	Surveillance Report LGM-30 Stage I (TP-H1011)	Sep 71
239	Surveillance Report LGM-30 Stage I (TP-H1011 and TP-H1043)	Apr 72
258	Surveillance Report LGM-30 A & B Stage I (TP-H1011)	Nov 72
268	Surveillance Report LGM-30 A & B Stage I (TP-H1011)	May 73
271	Surveillance Report LGM-30 F & G Stage I Phase A Series II, (TP-H1011)	Jul 73
277	Surveillance Report LGM-30 F & G Stage I Phase A Series III, (TP-H1011)	Oct 73
280	Surveillance Report LGM-30 A & B Stage I (TP-H1011)	Nov 73
288	Propellant Surveillance Report LGM-30 A & B, Stage I, TP-H1043	Mar 74
290	Propellant Surveillance Report LGM-30 F & G, Stage I, Phase B, Series I TP-H1011	Mar 74
300	Minuteman Stage I Motor Reliability Improvement Program Surveillance	May 74

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<u>Report Nr</u>	<u>Title</u>	<u>Report Date</u>
302	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Nov 74
313	Stage 1 Propellant Surveillance Report, Propellant Containing Glacial Acrylic Acid	Oct 74
315	Propellant Surveillance Report LGM-30 F & G Stage 1, TP-H1011	Jan 75
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321	Propellant Surveillance Report LGM-30 F & G Stage 1, Phase B, Series II, TP-H1011	Apr 75
325	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Jun 75
328	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Sep 75
330	Propellant Surveillance Report LGM-30 F & G Stage 1, TP-H1011	Oct 75
335	Stage 1 Motor Reliability Improvement Program	Dec 75
337	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1043	Feb 76
339	Stage 1, New MAPO & ERL-510 Qualification	Mar 76
341	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VII, TP-H1011	Mar 76

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343	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1011	Jun 76
345	Propellant Surveillance Report LGM-30 F & G, Stage 1 Phase B, Series III, TP-H1011	Jun 76
350	Qualification of a New MAPO Source and ERL-510 Curing Agent for Minuteman, Stage 1, UF-2121 Liner	Sep 76
351	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1011	Sep 76
354	Minuteman Stage 1 Motor Reliability Improvement Program Surveillance	Sep 76
358	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VIII, TP-H1011	Oct 76
360	Propellant Surveillance Report LGM-30 F & G, Stage 1 Phase E, Series III, TP-H1011	Nov 76
367	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1011	Apr 77
370	Propellant Surveillance Report LGM-30 F & G, Stage 1, Phase E, Series II, TP-H1011	Apr 77
377	Qualification of a New MAPO Source and ERL-510 Curing Agent for Minuteman Stage 1, UF-2121 Liner	Oct 77
379	Final RIP Report, Minuteman Stage 1 Motor Reliability Improvement Program Surveillance	Oct 77
385	Propellant Surveillance Report LGM-30 A, B, F, & G, Stage 1, TP-H1043	Dec 77
388	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Jan 78
390	Propellant Surveillance Report LGM-30 F & G Stage 1, Phase E, Series IV, TP-H1011	Feb 78
392	Propellant Surveillance Report LGM-30 Dissected Motors, Phase IX, TP-H1011	Mar 78
393	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	May 78

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<u>Report Nr</u>	<u>Title</u>	<u>Report Date</u>
396	Propellant Surveillance Report LGM-30 F & G Stage I, TP-H1011	Jun 78
405	Propellant Surveillance Report LGM-30 F & G Stage I, TP-H1011	Oct 78
406	Propellant Surveillance Report LGM-30 Dissected Motors, Phase X, TP-H1011	Nov 78
416	Propellant Surveillance Report LGM-30 F and G Stage I, TP-H1011	Apr 79
423	Propellant Surveillance Report LGM-30 F and G Stage I, TP-H1011	Oct 79
424	Propellant Surveillance Report LGM-30 Stage I, TP-H1043	Nov 79
425	Propellant Surveillance Report LGM-30 A and B Stage I, TP-H1011	Nov 79
427	Propellant Surveillance Report LGM-30 Dissected Motors, Phase XI, TP-H1011	Nov 79
438	Propellant Surveillance Report LGM-30 F and G Stage I, TP-H1011	Apr 80

GLOSSARY OF TERMS AND ABBREVIATIONS

Aging Trend	A change in properties or performance resulting from aging of material or component
CSA	Cross Sectional Area
DB	Dogbone
Degradation	Gradual deterioration of properties or performance
E	Modulus (psi), defined as stress divided by strain along the initial linear portion of the curve.
EB	End Bonded
EGL	Effective Gage Length
em	Strain at maximum stress
er	Strain at rupture
"F" ratio	The ratio of the variance accounted for by the regression function to the random unexplained variance. The regression function having the most significant "F" ratio is used for plotting data. The ratio is also used in detecting significant changes in random variation between succeeding time points
JANNAF	Joint Army, Navy, NASA, Air Force Committee
MANCP	Propellant Lab Section at Ogden Air Logistics Center
Ogden ALC	Ogden Air Logistics Center, Air Force Logistics Command
r or R	The Correlation Coefficient is a measure of the degree of closeness of the linear relationship between two variables
Linear Regression Equation	The general form of the linear regression equation is $Y = a + bx$
Regression Line	Line representing mean test values with respect to time
s_b	Standard error of estimate of the regression coefficient

GLOSSARY OF TERMS AND ABBREVIATIONS (cont)

S_e or $S_{y,x}$	Standard deviation of the data about the regression line
S_m	Maximum Stress
S_r	Stress at rupture
Standard Deviation (S_y)	Square root of variance
Strain Rate	Crosshead speed divided by the EGL
"t" test	A statistical test used to detect significant differences between a measured parameter and an expected value of the parameter (determines if regression slope differs from zero at the 95% confidence level)
Variance	The sum of squares of deviations of the test results from the mean of the series after division by one less than the total number of test results
3 Sigma Band	The area between the upper and lower 3 sigma limit. It can be expected that 99.73% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed.
90-90 Band	It can be stated with 90% confidence that 90% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed
Significant	As used in the statistical sense, means a difference unlikely to have been the result of random sampling from some specified population.

INTRODUCTION

A. PURPOSE:

Laboratory testing has been performed for fourteen and one-half years on First Stage LGM-30 F and G Minuteman Motor propellant blocks to evaluate the effects of aging on TP-H1011 propellant. This report contains those tests conducted on propellant as instructed in MMWRBM Test Directive GTD-1C, Amendment 2, LGM-30 First Stage Operational Propellant Laboratory Testing.

Statistical analysis of the data from tests performed will provide early warning if serious degradation trends develop. Annual evaluation of the propellant provides data for input into engineering reliability analysis for service life predictions.

B. BACKGROUND:

LGM-30 F and G testing was started in 1966 with phase testing at 24 month intervals (Report Numbers 78 - zero time; 104, 162, 185-Phase I; 176, 239, 257-Phase II; 271-Phase III). Report Number 257 was the first time that LGM-30 F and G data were statistically analyzed separately from LGM-30A and B data. The present report is a continuation of testing and statistical analysis.

Zero time testing for LGM-30A, B, F and G was started as soon as possible after receipt of the propellant by MAKPH. Data from these tests were used to establish a base line for each test parameter.

The LGM-30F and G propellant test matrix (Table 1) is used to determine the number of specimens to be taken from each propellant loaf and the specific test or tests to which these specimens are to be subjected. Very low rate and low rate tensile specimens are taken on all LGM-30F and G blocks. Specimens for other physical and combustion tests are taken from every third (LGM-30F and G) block.

TABLE 1
SAMPLE PLAN

The Procedure for determining tests to be performed on propellant batch samples of LOM-30 F & G First Stage Motors are as follows:

1. Divide the USAF motor serial numbers into three groups by dividing the last three digits of each serial number by three to determine the remainder integer, e.g., $154 \div 3 = 51$ with a remainder integer of 1.
2. Use the remainder integer to enter the following matrix to determine the group of tests to be performed on the forward, middle, and aft batch samples associated with a particular motor serial number.

TP-HN011 PROPELLANT BATCH SAMPLE		GROUP I	GROUP II	GROUP III
Forward		1	2	0
Middle		0	1	2
Aft		2	0	1

Each group will receive the following tests:

TEST MATRIX		GROUP I	GROUP II	GROUP III
High Rate Triaxial	Dynamic Response			High Rate Hydrostatic
Creep	Stress Relaxation			Sol Gel
Biaxial Low Rate	Burning Rate			DSC
TCLG	Heat of Explosion			TGA
Hardness	Pressure Time			DTA
Ignitability				Impact

NOTE: Low Rate and Very Low Rate Tensile tests are performed on all blocks.

STATISTICAL APPROACH

In order to determine aging trends for shelf/service life predictions, as directed by Service Engineering, First Stage LGM-30 F and G Minuteman TP-H1011 propellant blocks have been undergoing testing since 1966, statistically analyzed and reported on a regular test cycle by this laboratory.

The primary reason for performing statistical analysis on test data is for the detection of propellant changes due to aging that would affect motor reliability. Regression analysis was the method used to examine data and to aid in drawing conclusions about dependency relationships that may exist i.e., relationship between age versus test results.

In selecting the best fit model for the regression equation, the linear model $Y = a + bX$ was found to be the best fit model for the regression plots.

Individual data points from different time periods were used to establish a least squares trend line for the data. The variance about the regression line, obtained using individual values of the dependent variable, was used to compute a tolerance interval such that at the 90% confidence level 90% of the sample distribution falls within this interval. This tolerance interval was extrapolated to a maximum of 24 months into the future from age of the oldest motor tested. The 't' value and the significance of this statistic, which are reported for each regression model, give an indication of the "statistical significance" of the slope of the trend line as compared to a line of zero slope. When a regression slope is indicated to be significant, it should be noted that the slope of the regression line is significant from a statistical standpoint and it is an indication that a change over time is occurring, but does not necessarily mean that the indicated change in the

value obtained during testing is significant in regards to motor operational performance. In a few cases, this small change has become the apparent trend in data variance and regression line trends. However, the changes are gradual and no operational problems are expected at this time.

The data were plotted by computer. The 'y' axis is computed so that the values at one inch intervals are peculiar to the data spread of the parameter tested. Plotted data points represent means at the particular ages at which testing occurred. The number of specimens at each age point is indicated on the sample size summary sheet accompanying the regression plot. Variance at each test age can be determined by consulting the GO85 data storage system.

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TEST RESULTS

VERY LOW RATE TENSILE:

Very low rate regressions show a statistically significant decrease for strain at maximum stress and strain at rupture. The stresses and modulus show a statistically significant increase (Figures 1 thru 5). The trends are gradual for the respective regressions and no operational problems from the propellant are expected for at least two years beyond the last test data.

LOW RATE BLAXIAL TENSILE:

The strain at maximum stress regression shows a statistically significant gradual increase with the strain at rupture showing no statistically significant change. The stresses and modulus show a statistically significant increase (Figures 6 thru 10).

LOW RATE TENSILE:

Low rate tensile data regressions show a statistically significant gradual decrease for strains and a statistically significant increase for stresses and modulus (Figures 11 thru 15).

HIGH RATE TRIAXIAL TENSILE:

The strain at maximum stress, strain at rupture and modulus regressions show a statistically significant decrease. Maximum stress shows a statistically significant increase. Stress at rupture does not show a significant change (Figures 16 thru 20).

HIGH RATE HYDROSTATIC TENSILE:

The strains show a statistically significant decrease. The stresses and modulus show a statistically significant increase (Figures 21 thru 25).

TEAR ENERGY:

The cohesive energy shows a statistically significant decrease (Figure 26).

TENSILE SUMMARY:

The test data regressions show that the strain is gradually decreasing and the stress and modulus gradually increasing.

Based on the analysis of test data regressions, it does not appear that meaningful degradation is occurring at this time and no operational problems are expected in the propellant for at least two years beyond the last data point.

STRESS RELAXATION MODULUS:

For the 0.5% strain at -65°F, the regressions for data at 10, 50, 100, and 1000 seconds show a statistically significant gradual increase. (Figures 27 thru 30).

At -40°F, the 10, 50, and 100 second regressions show a statistically significant increase. The 1000 second regression shows no statistically significant change. (Figures 31 thru 34).

The 3% strain regressions at 20°F, 77°F, 100°F, and 180°F show a statistically significant gradual increase. (Figures 35 thru 54).

SOL GEL:

The percent extractables, density and gel swell ratio do not show a significant change. The crosslink density regression shows a statistically significant increase (Figures 55 thru 58).

CONSTANT STRAIN:

A statistically significant gradual decrease is shown for constant strain (Figure 59).

HARDNESS:

Shore A ten second hardness shows a statistically significant increase (Figure 60).

SUMMARY OF SOL GEL, TENSILE AND HARDNESS DATA:

The crosslink density, constant strain and hardness data regressions correlate with the tensile data. As the polymer continues to crosslink, the strains decrease and the stresses increase.

PRESSURE TIME:

Maximum pressure shows no significant change while time to maximum pressure shows a statistically significant gradual decrease (Figures 61 and 62).

TCLE (Thermal Coefficient of Linear Expansion):

The thermal coefficient of linear expansion for both above and below the glass transition point (Tg) shows a statistically significant gradual increase (Figures 63 and 64).

TGA (Thermal Gravimetric Analysis):

A statistically significant increase is shows for the ignition temperature (9°C rise/min), the percent weight loss at 250°C hold (12°C rise/min to hold) and the weight loss at ignition (Figures 65 thru 67).

DTA (Differential Thermal Analysis):

The endotherm and first and second exotherms show a statistically significant decrease. The third exotherm shows a statistically significant increase and the ignition temperature with no significant change (Figures 68 thru 72).

BURNING RATE:

The burning rate shows a statistically significant gradual increase (Figure 73).

DIFFERENTIAL SCANNING CALORIMETER:

The endotherm and first and second exotherms shows a statistically significant decrease. (Figures 74 thru 76).

THERMAL AND COMBUSTION SUMMARY:

The time to maximum pressure from the pressure time data and burning rate data show a correlation. In both cases, the regressions show a gradual increase in rate of reaction. The maximum pressure and DSC regressions also correlate well with each other. In both cases, a gradual decrease in energy is shown.

The ignition temperatures for TGA shows a gradual increase.

From the analyses of the regressions, no combustion problems are expected for at least two years beyond the oldest data point.

CONSLUSIONS

Fourteen and one-half years of aging at ambient temperature (77°F) has not greatly changed the properties of the propellant. Some test parameters indicate slight aging trends, but nothing that would adversely affect the operational characteristics of the rocket motor propellant.

From the statistical analysis, it does not appear that significant propellant degradation is occurring. Based on fourteen and one-half years of accumulated data, there is no reason to suspect that properties will show much change for at least two years past the last data point. Therefore, propellant reliability should not change appreciably over that time period. Since failure limits are not available for the parameters tested, this statement is based on the fact that the slope of the regression curves where statistically significant are, with few exceptions, relatively flat or close to a line of zero slope and have not changed appreciably from the last test period.

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP										
6	3	33	152	58	352	83	80	108	93	133	82
9	19	34	154	59	317	84	56	109	120	134	126
10	11	35	113	60	418	85	76	110	63	135	60
11	15	36	226	61	290	86	92	111	42	136	51
12	30	37	147	62	337	87	122	112	139	137	99
13	48	38	126	63	243	88	139	113	297	138	256
14	28	39	119	64	160	89	177	114	165	139	157
15	38	40	122	65	108	90	156	115	133	140	78
16	46	41	156	66	70	91	107	116	321	141	40
17	55	42	123	67	43	92	82	117	247	142	45
18	28	43	142	68	179	93	117	118	149	143	203
19	49	44	106	69	234	94	95	119	133	144	97
20	24	45	135	70	287	95	146	120	210	145	12
21	56	46	122	71	135	96	148	121	123	146	21
22	27	47	166	72	124	97	150	122	81	147	30
23	67	48	177	73	110	98	159	123	4H	148	40
24	55	49	199	74	152	99	191	124	45	149	12
25	63	50	168	75	198	100	162	125	84	150	27
26	47	51	347	76	147	101	136	126	53	151	51
27	50	52	314	77	167	102	51	127	107	152	9
28	56	53	295	78	91	103	68	128	60	153	6
29	40	54	232	79	117	104	84	129	75	154	27
30	73	55	474	80	113	105	32	130	104	155	15
31	66	56	461	81	155	106	11	131	212	156	23
32	153	57	392	82	170	107	71	132	156	157	12
										158	21
										159	28
										160	9
										161	33
										162	18
										163	9
										165	9
										166	18
										167	20
										169	18
										171	3
										172	2

WING 6, V.L.F. TENSILE, STRAIN AT MAX STRESS, C-F-S=0.002 IN/IN IN-11011

This sample size summary is applicable to figures 1 thru 4

$F = +9.4222983E+00$ $\gamma = 11.0613719E-01$ $\beta = (-1.0456836E-05) \times X$
 $F =$ SIGNIFICANT $\gamma =$ SIGNIFICANT $\beta = +1.6556958E-02$
 $R = -2.2335906E-02$ $S_F = +3.4066058E-06$
 $\alpha = +3.0695762E+00$ $S_\gamma = +1.6553266E-02$
 $N = 18879$ $S_\beta = +1.6553266E-02$
DEGREES OF FREEDOM = 18877 TEST CONDITIONS = AMB TEMP/RH

STORAGE CONDITIONS = AMB TEMP/RH

PARAMETER = STRAIN AT MAX STRESS

UNIT OF MEASURE = IN/IN



WING 6.V.L.R. TENSILE STRAIN AT MAX STRESS, CHS=0.002 IN/MIN TP-H1011

Figure 1

$F = +1.7792116E+03$ $Y = (+7.5518493E+01) + (+6.0153802E-02) \times X_1$
 $R = +2.9347962E-01$ SIGNIFICANCE OF F = SIGNIFICANT
 $t = +4.2180702E+01$ SIGNIFICANCE OF R = SIGNIFICANT
 $N = 18880$ DEGREES OF FREEDOM = 18878
 STORAGE CONDITIONS = AMB TEMP/RH

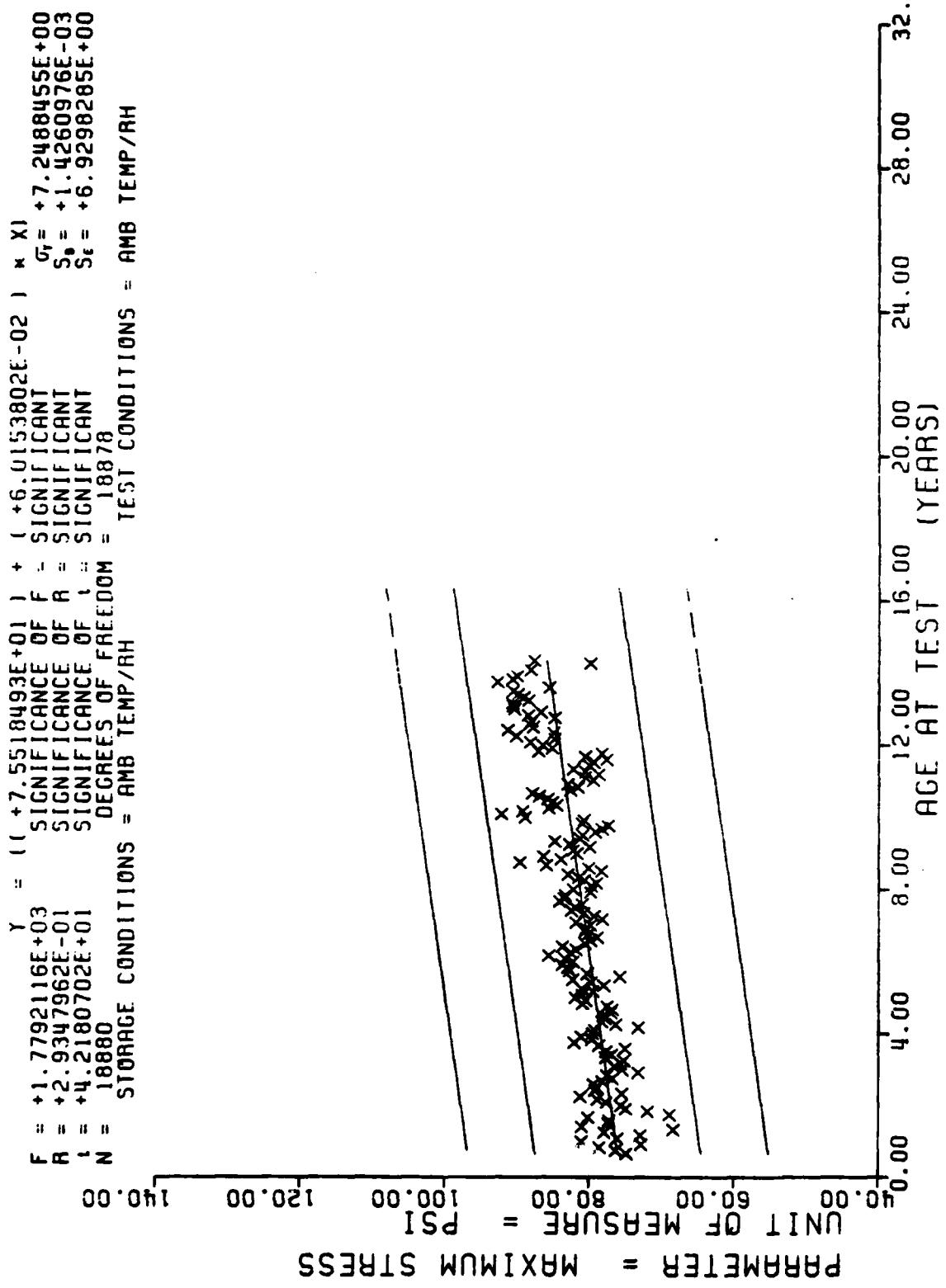


Figure 2

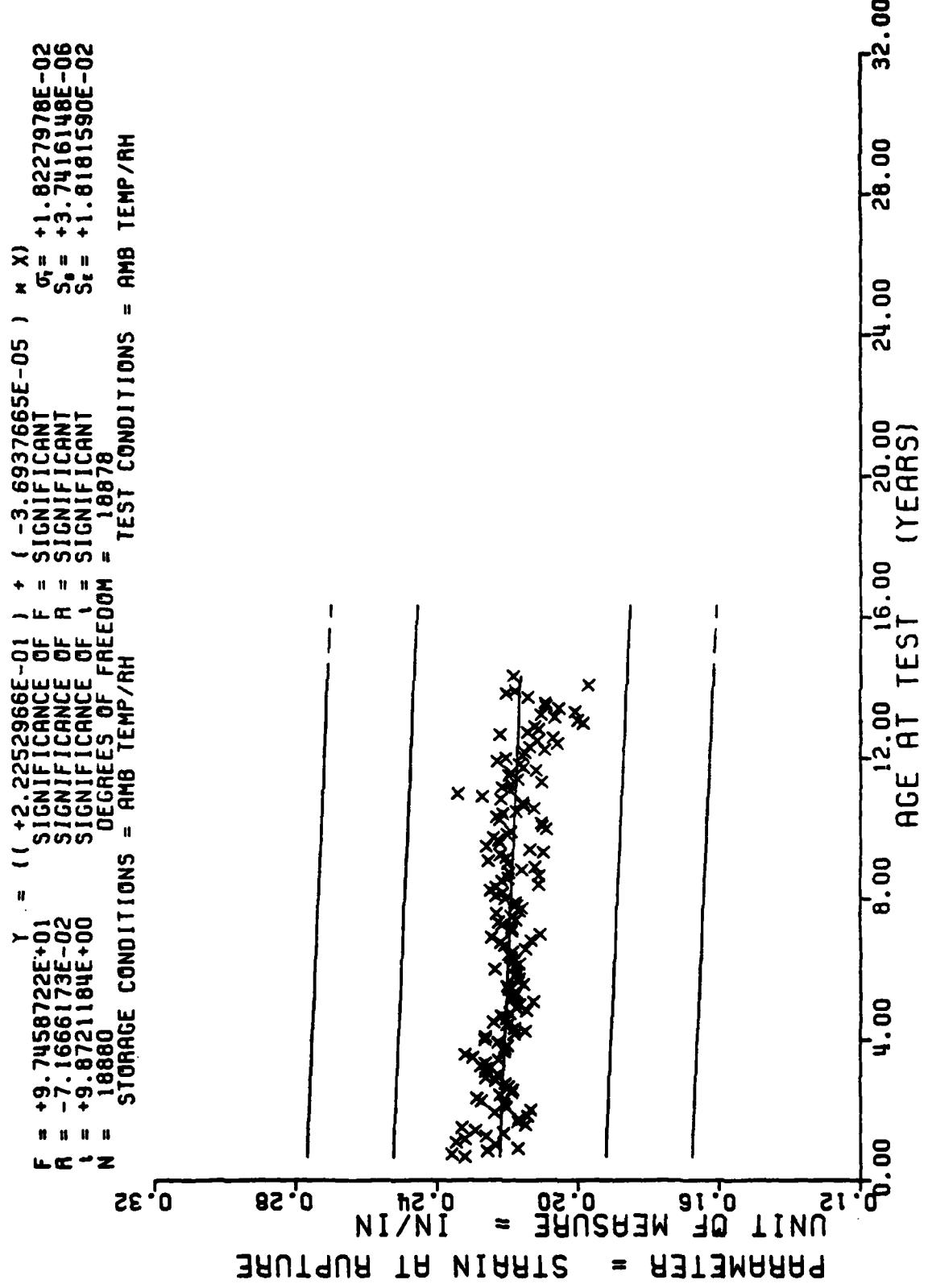


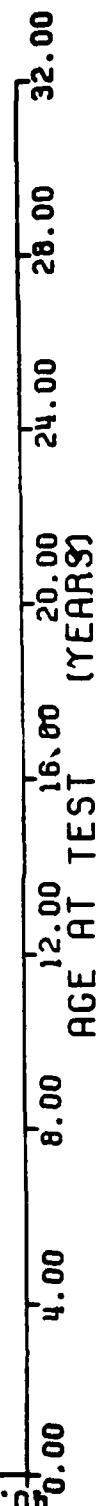
Figure 3

WING 6, V.L.R. TENSILE, STRAIN AT RUPTURE, CHS=0.002 IN/MIN TP-H1011

$\gamma = ((+7.0204526E+01) + (+7.6949878E-02) * X)$
 $F = +2.0491300E+03$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +3.1650723E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $I = +4.5267317E+01$ SIGNIFICANCE OF I = SIGNIFICANT
 $N = 18406$ DEGREES OF FREEDOM = 18406
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

PARAMETER = STRESS AT RUPTURE
 UNIT OF MEASURE = PSI
 40.00 60.00 80.00 100.00 120.00 140.00

- 15 -



WING 6, V.L.R. TENSILE, STRESS AT RUPTURE, CHS=0.002 IN/MIN TP-H1011

Figure 4

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NP SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NR SAMP
8	3	13	152	58	352	83	80	108	93	133	79
9	19	34	154	59	344	84	56	109	120	134	117
10	11	35	113	60	442	85	76	110	57	135	60
11	15	36	226	61	293	86	91	111	42	136	51
12	30	37	147	62	342	87	122	112	130	137	93
13	48	38	126	63	259	88	138	113	297	138	256
14	28	39	119	64	160	89	177	114	160	139	154
15	35	40	122	65	105	90	156	115	130	140	72
16	46	41	156	66	79	91	107	116	315	141	34
17	55	42	123	67	47	92	82	117	247	142	42
18	28	43	142	68	174	93	108	118	149	143	197
19	49	44	106	69	234	94	99	119	113	144	92
20	24	45	135	70	287	95	145	120	192	145	6
21	56	46	122	71	138	96	180	121	102	146	21
22	27	47	166	72	121	97	150	122	41	147	21
23	67	48	177	73	91	98	156	123	42	148	40
24	55	49	159	74	143	99	191	124	45	149	12
25	63	50	188	75	177	100	163	125	84	150	24
26	47	51	347	76	135	101	136	126	53	151	45
27	50	52	314	77	161	102	51	127	101	152	3
28	57	53	295	78	89	103	65	128	60	153	5
29	49	54	232	79	117	104	84	129	75	154	15
30	73	55	474	80	111	105	33	130	181	155	15
31	68	56	463	81	155	106	11	131	200	156	15
32	153	57	390	82	178	107	26	132	153	157	9
									158	15	
									159	18	
									160	3	
									161	18	
									162	6	
									169	6	
									171	3	
									172	2	

WING 6.V.L.Q.1=NSILF.1=CRULUS.CHS=0.012 IN/MIN TP-H111

This sample size summary is applicable to figure 5

$F = +1.0553960E+03$ $y = ((+5.2456141E+02) + (+5.7141144E-01) * x)$
 $F = \text{SIGNIFICANT}$ $\sigma_F = +8.7746799E+01$
 $F = \text{SIGNIFICANT}$ $S_F = +1.7569002E-02$
 $F = \text{SIGNIFICANT}$ $S_0 = +8.5397651E+01$
 $F = \text{SIGNIFICANT}$ $S_1 = +8.5397651E+01$
 $\text{DEGREES OF FREEDOM} = 18904$
 $\text{STORAGE CONDITIONS} = \text{AMB TEMP/RH}$ $\text{TEST CONDITIONS} = \text{AMB TEMP/RH}$

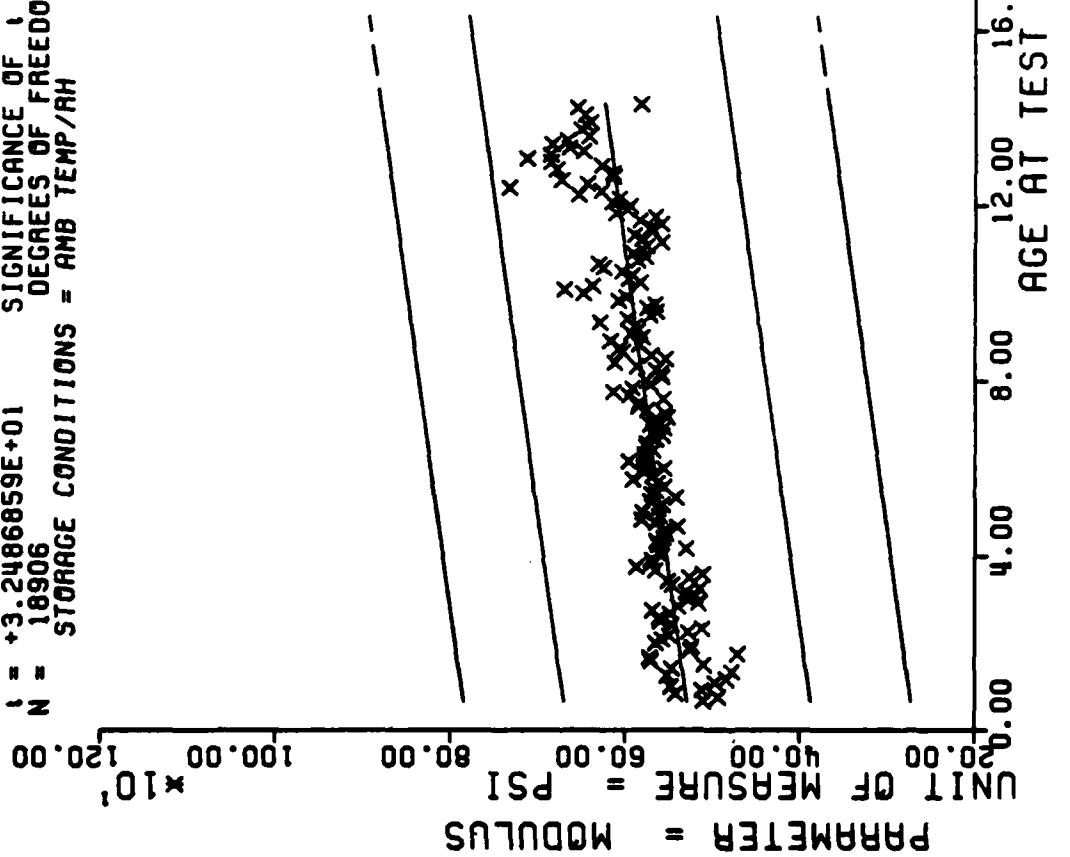


Figure 5

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP										
1	1	33	22	58	40	83	16	108	14	135	16
8	2	34	26	59	31	84	10	109	22	136	2
9	4	35	26	60	45	85	6	110	25	137	17
11	6	36	34	61	35	86	7	111	16	138	69
12	14	37	14	62	57	87	8	112	16	139	36
13	22	38	11	63	54	88	10	113	15	140	8
14	4	39	28	64	42	89	8	114	66	141	8
15	16	40	16	65	18	90	6	115	19	142	6
16	12	41	14	66	27	91	15	116	46	143	24
17	14	42	8	67	32	92	10	117	68	144	41
18	16	43	2	68	32	93	10	118	32	145	4
19	14	44	5	69	34	94	29	119	32	146	8
20	16	45	4	70	43	95	27	120	44	147	2
21	12	46	10	71	17	96	30	121	32	148	4
22	10	47	16	72	16	97	37	122	8	149	6
23	13	48	24	73	24	98	53	123	4	150	6
24	16	49	34	74	20	99	40	125	10	151	4
25	25	51	24	75	35	100	18	127	10	152	5
26	22	51	34	76	14	101	14	128	5	153	2
27	24	52	49	77	19	102	8	129	6	154	2
28	28	53	41	78	22	103	3	130	24	155	2
29	23	54	20	79	20	104	14	131	78	156	2
30	26	55	32	80	17	105	4	132	24	157	10
31	26	56	36	81	29	106	6	133	12	159	4
32	42	57	40	82	24	107	2	134	19	160	2
										161	2
										166	2
										168	2
										169	2
										171	2

WING 6, L.O.P. BIAXIAL TENSILE, STRAIN AT MAX STRESS, CH5=0.2 IN/IN TH=1011

169

171

This sample size summary is applicable to figures 6 thru 10

$F = +2.8655620E+01$ $\gamma = ((+2.1279627E-01) + (+6.7049873E-05)) \times X$
 $R = +9.5292803E-02$ SIGNIFICANT
 $S_a = +5.3530944E+00$ SIGNIFICANT
 $S_t = +2.72466810E-02$ SIGNIFICANT
 $N = 3129$ DEGREES OF FREEDOM = 3127
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

PARAMETER = STRAIN AT MAX STRESS

UNIT OF MEASURE = IN/IN

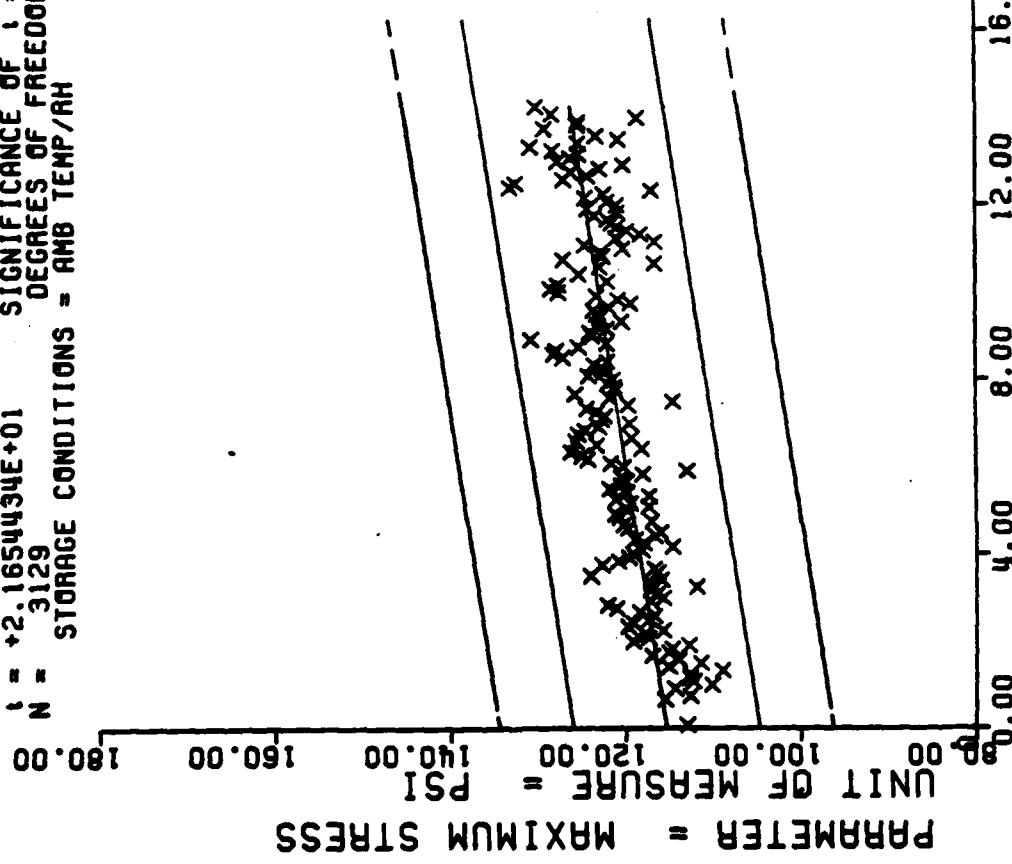
0.00 0.13 0.16 0.18 0.23 0.28 0.33 0.38

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WING & L. R. BIAXIAL TENSILE STRAIN AT MAX STRESS, CHS=0.2 IN/MIN TPH-1011

Figure 6

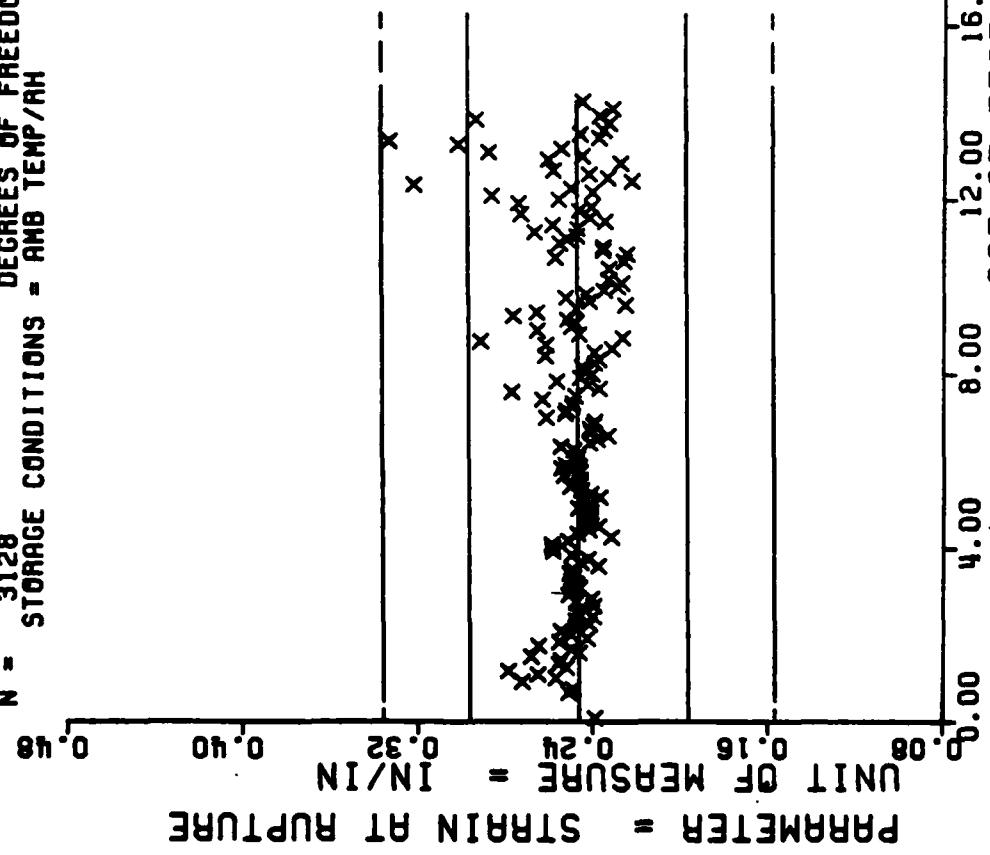
$F = +4.6891455E+02$ $\text{SIGNIFICANCE OF } F = \text{SIGNIFICANT}$
 $R = +3.6111220E-01$ $\text{SIGNIFICANCE OF } R = \text{SIGNIFICANT}$
 $\text{SIGNIFICANCE OF } \sigma = \text{SIGNIFICANT}$
 $\text{DEGREES OF FREEDOM} = 3127$
 $N = 3129$ $\text{STORAGE CONDITIONS = AMB TEMP/RH}$ $\text{TEST CONDITIONS = AMB TEMP/RH}$



WING 6, L.R. BIAXIAL TENSILE, MAXIMUM STRESS, CHS=0.2 IN/MIN TPH-1011

Figure 7

$F = +8.4209113E-01$ $\gamma = (1 + 2.4625715E-01) + (1.2601488E-05) \times X$
 $R = +1.6410679E-02$ SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma_f = +2.9866893E-02$
 $\alpha = +9.1765523E-01$ SIGNIFICANCE OF R = NOT SIGNIFICANT $S_0 = +1.3732268E-05$
 $N = 3126$ SIGNIFICANCE OF α = NOT SIGNIFICANT $S_\alpha = +2.9867648E-02$
DEGREES OF FREEDOM = 3126 TEST CONDITIONS = AMB TEMP/RH

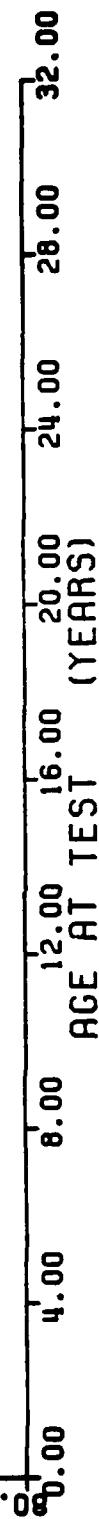


WING 6, L.R. BIAXIAL TENSILE, STRAIN AT RUPTURE, CHS=0.2 IN/MIN TPH-1011

Figure 8

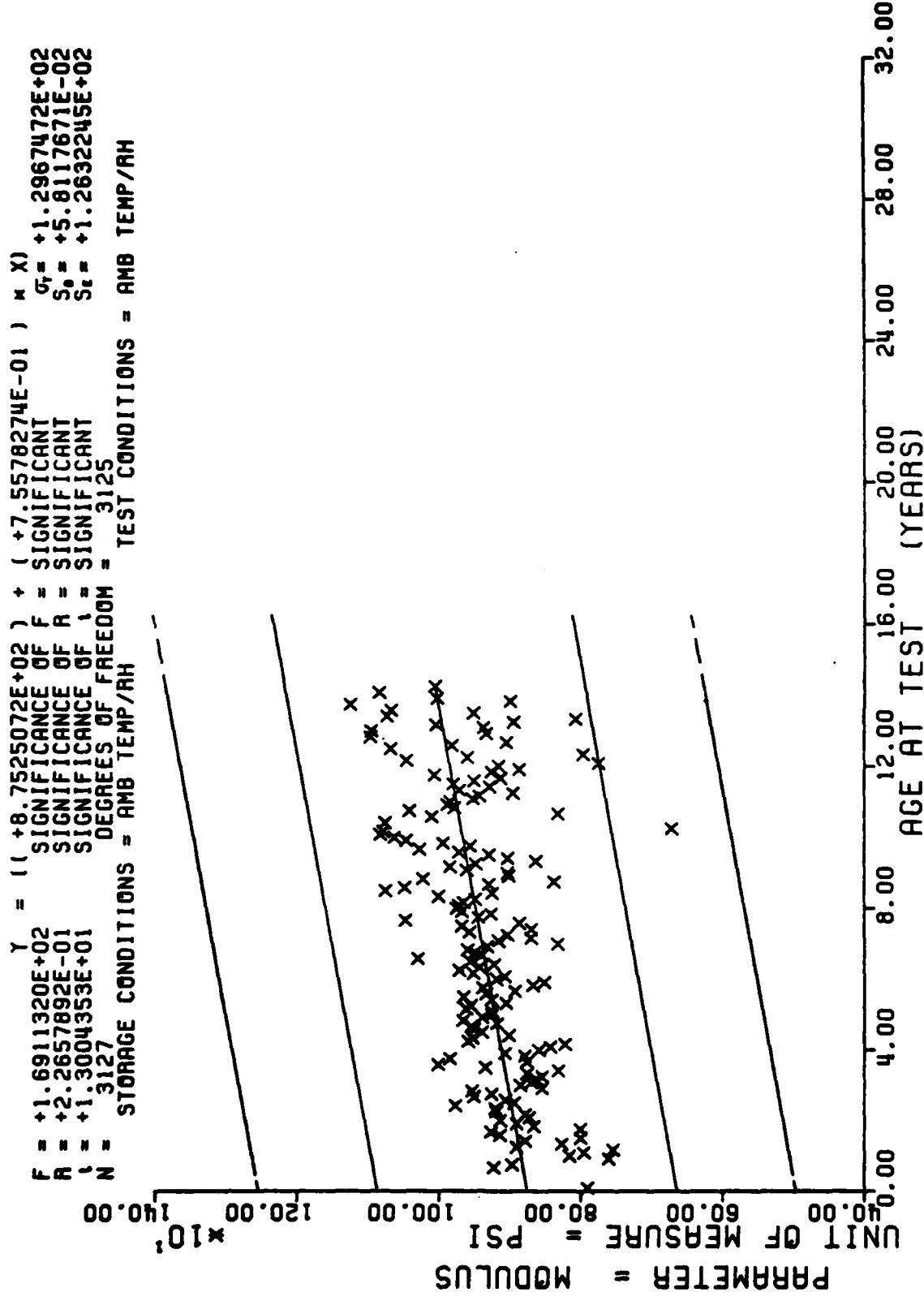
$F = +4.8548355E+02$ $F = ((+1.0959443E+02) + (+7.2532994E-02) \times X)$ $\sigma_r = +7.6945984E+00$
 $F =$ SIGNIFICANCE OF F = SIGNIFICANT $S_o = +3.2919129E-03$
 $R = +3.6664388E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_e = +7.1599020E+00$
 $R^2 = +2.2033691E+01$ SIGNIFICANCE OF R^2 = SIGNIFICANT
 $D = +2.3128$ DEGREES OF FREEDOM = 3126 TEST CONDITIONS = AMB TEMP/RH
 $N =$ STORAGE CONDITIONS = AMB TEMP/RH

PARAMETER = STRESS AT RUPTURE UNIT OF MEASURE = PSI
 80.00 100.00 120.00 140.00 160.00



WING 6.L.R. BIAXIAL TENSILE, STRESS AT RUPTURE, $CH_5=0.2$ IN/MIN TPH-1011

Figure 9



WING 6, L.R. BIAXIAL TENSILE, MODULUS, CHS=0.2 IN/MIN TPH-1011

Figure 10

*** SAMPLE SIZE SUMMARY ***									
AGR (MOS)	NP SAMP	AGR (MOS)	NR SAMP	NP SAMP	AGR (MOS)	NR SAMP	NP SAMP	AGR (MOS)	NR SAMP
2	3	28	82	53	97	78	177	103	53
4	57	29	55	54	83	79	129	104	81
5	151	30	52	55	43	87	132	105	18
6	191	31	52	56	108	81	179	106	15
7	171	32	124	57	172	82	94	107	27
8	143	33	85	58	158	83	100	108	111
9	194	34	78	59	134	84	75	109	109
10	189	35	44	60	159	85	83	116	62
11	192	36	154	61	189	86	60	111	33
12	220	37	83	62	218	87	153	112	96
13	213	38	39	63	283	88	143	113	120
14	222	39	93	64	134	89	150	114	73
15	223	40	65	65	75	90	117	115	77
16	212	41	35	66	61	91	94	116	270
17	184	42	69	67	104	92	80	117	261
18	26	43	75	68	110	93	81	118	161
19	67	44	21	69	154	94	131	119	117
20	18	45	20	70	188	95	136	120	253
21	78	46	58	71	172	96	228	121	115
22	43	47	106	72	145	97	242	122	38
23	30	48	85	73	153	98	226	123	40
24	77	49	122	74	172	99	147	124	42
25	51	50	108	75	241	100	65	125	60
26	56	51	175	76	158	101	103	126	78
27	59	52	223	77	154	102	22	127	59

WING 6.L.P.TENSILF,STRAIN AT MAX STRFSS,CHS=2.0 IN/MIN TP-H1011

This sample size summary is applicable to figures 11 thru 15

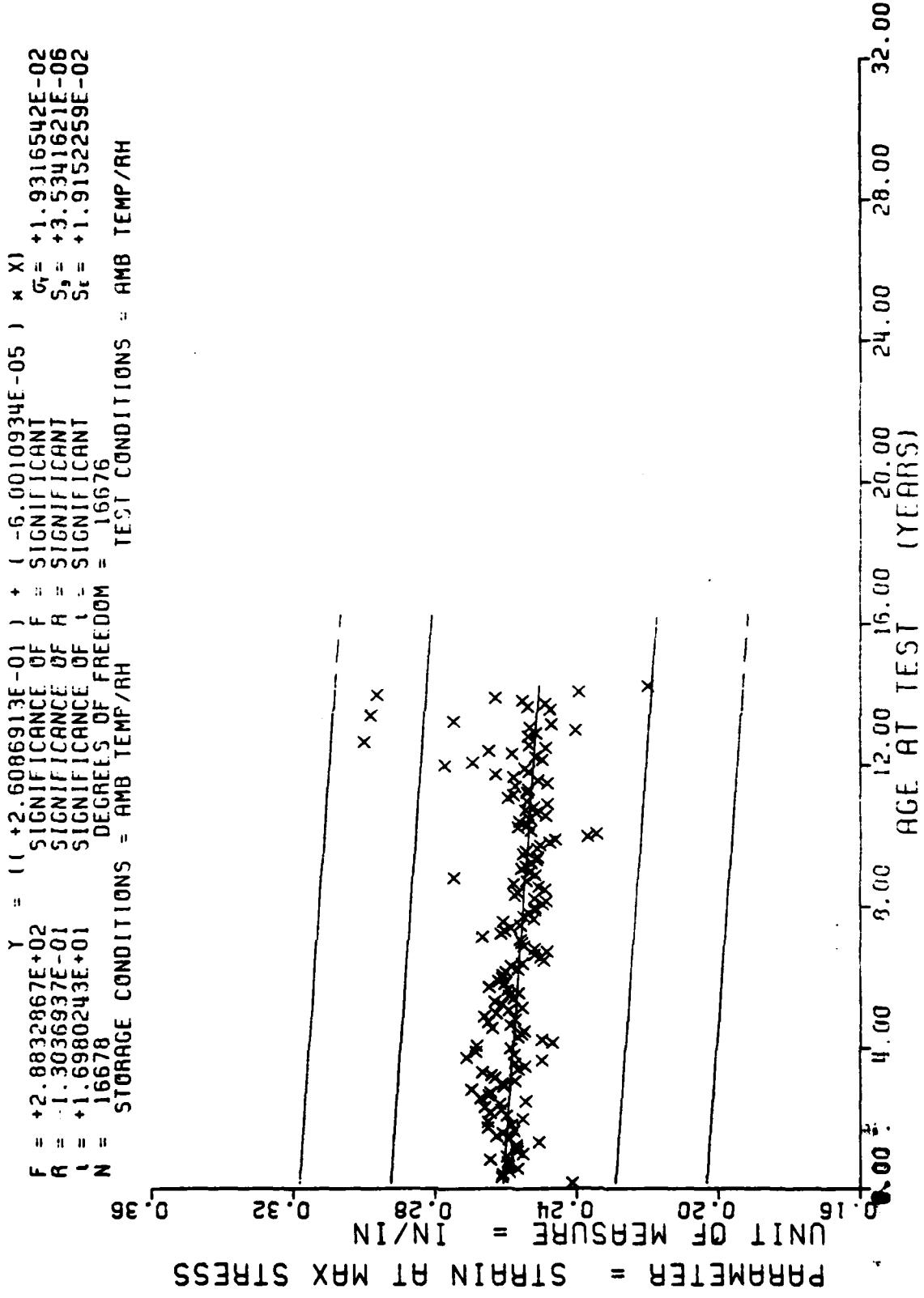
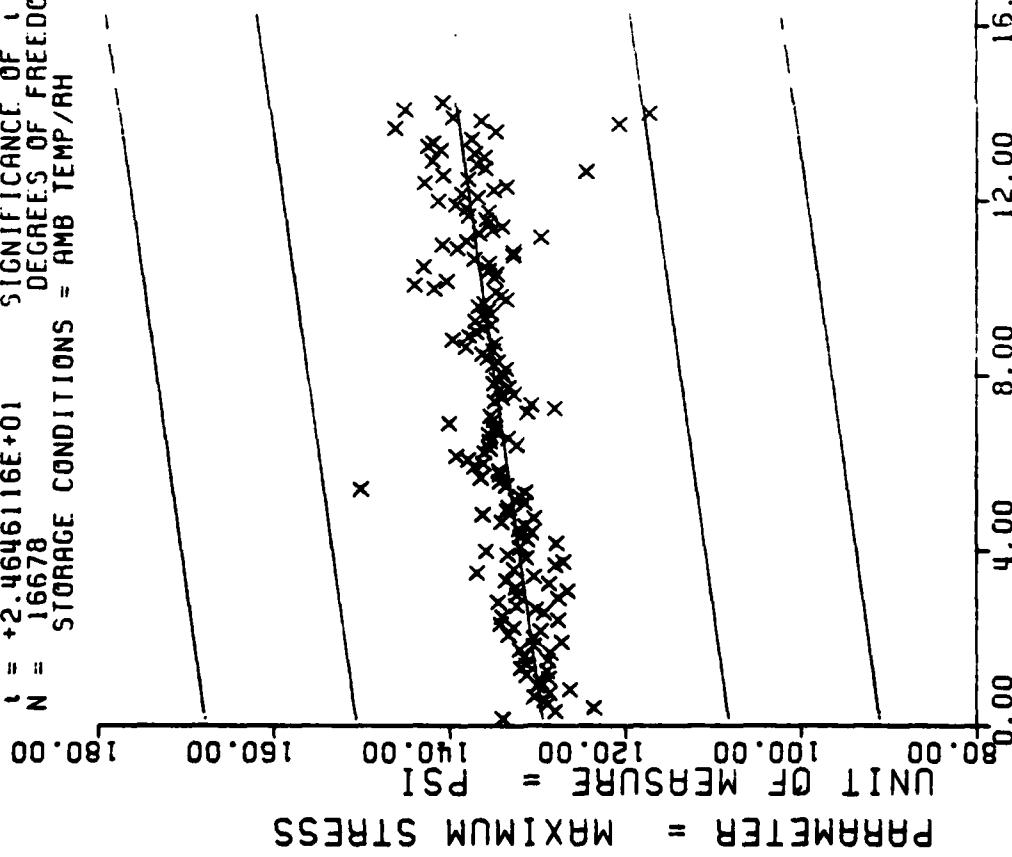


Figure 11

$F = +6.0743105E+02$ $Y = ((+1.2932618E+02) + (+5.8265519E-02) \times X)$
 $F =$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +1.8747074E-01$ $S_f = +1.3042255E+01$
 $R =$ SIGNIFICANCE OF R = SIGNIFICANT
 $L = +2.4646116E+01$ $S_o = +2.3640852E-03$
 $L =$ SIGNIFICANCE OF L = SIGNIFICANT
 $N = 16678$ $S_e = +1.2811402E+01$
 $N =$ DEGREES OF FREEDOM = 16676
 $N =$ STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



WING 6, L.R. TENSILE, MAXIMUM STRESS, CHS=2.0 IN/MIN TP-H101

Figure 12

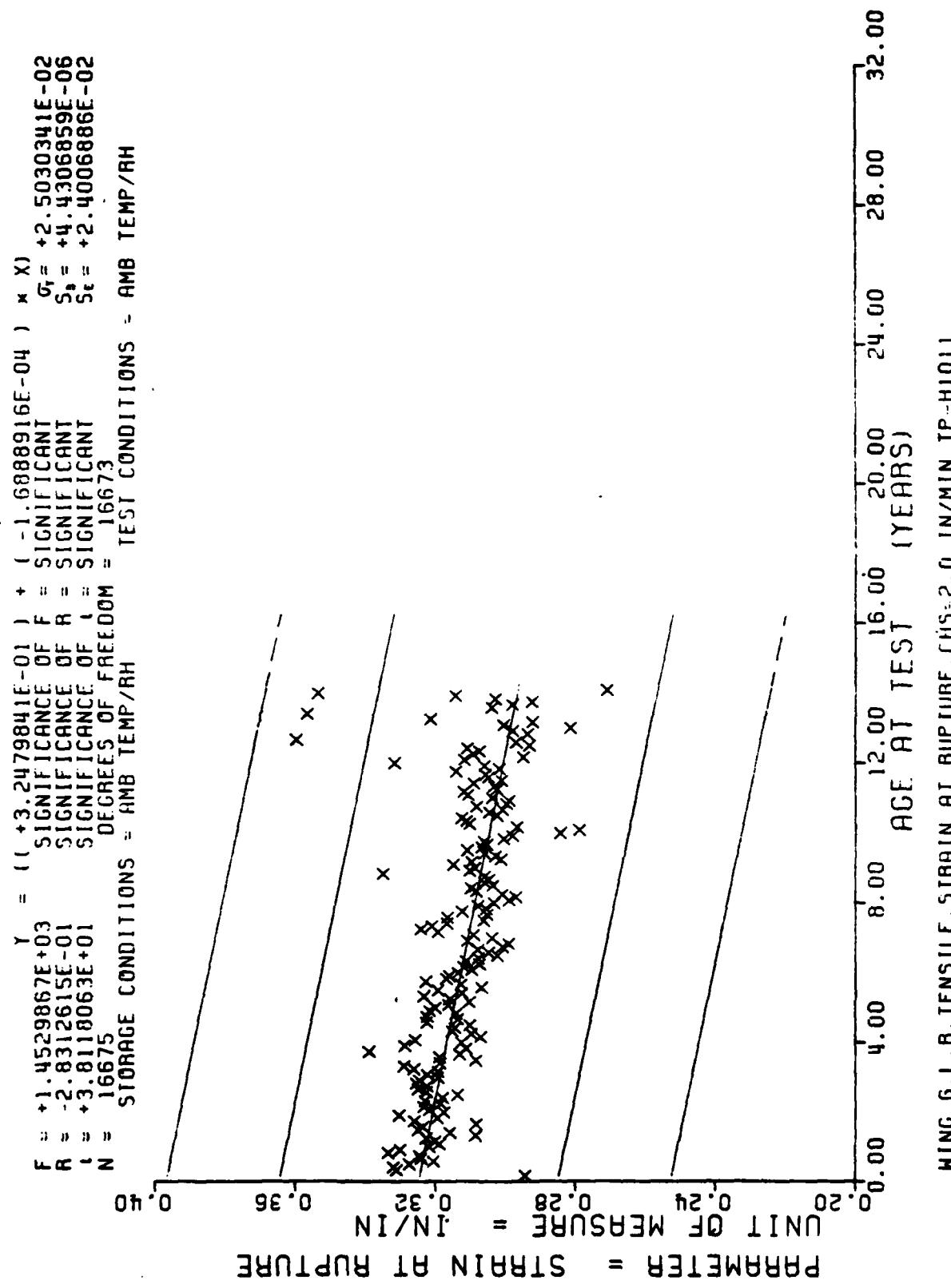


Figure 13

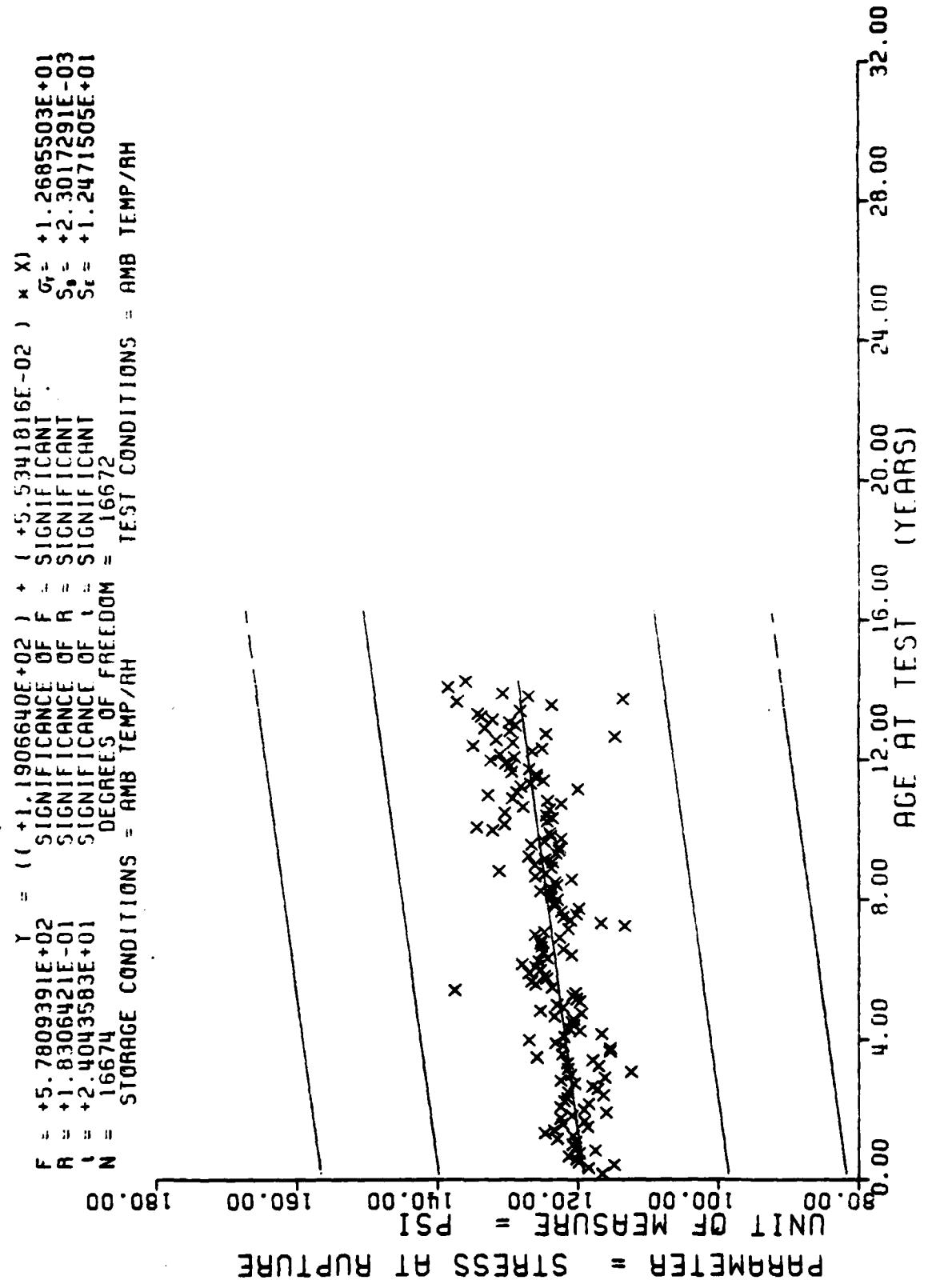


Figure 1h

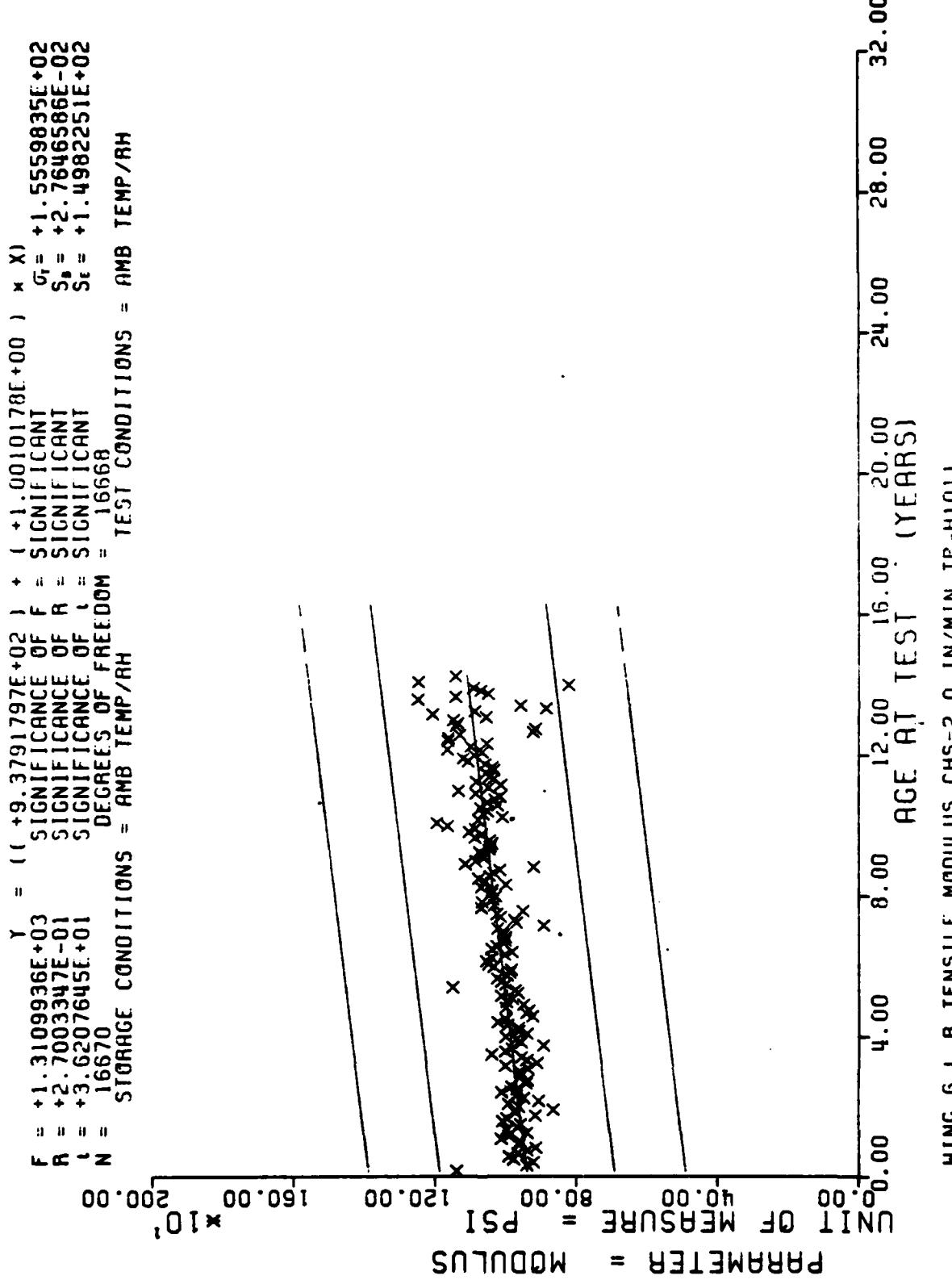


Figure 15

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGF (MOS)	NR SAMP								
1	2	3.3	2.3	5.8	3.0	8.1	9	10.8	6	1.34	14
6	2	3.4	2.2	5.9	2.7	8.4	6	10.9	19	1.35	14
9	4	3.5	2.4	6.0	2.2	8.5	14	11.0	32	1.36	4
11	4	3.6	2.6	6.1	3.6	8.6	8	11.1	6	1.37	10
12	14	3.7	1.6	6.2	3.8	8.7	10	11.2	8	1.38	25
13	17	3.8	1.1	6.3	4.1	8.8	16	11.3	18	1.39	14
14	6	3.9	2.5	6.4	4.2	8.9	19	11.4	49	1.40	4
15	6	4.0	1.0	6.5	2.8	9.0	15	11.5	53	1.41	9
16	8	4.1	6	6.6	2.7	9.1	27	11.6	57	1.42	8
17	4	4.2	6	6.7	2.8	9.2	6	11.7	42	1.43	4
18	14	4.3	2	6.8	2.9	9.3	12	11.8	21	1.44	41
19	11	4.4	4	6.9	24	9.4	16	11.9	21	1.45	25
20	20	4.5	2	7.0	59	9.5	16	12.0	39	1.46	6
21	4	4.6	6	7.1	3.8	9.6	13	12.1	8	1.47	4
22	12	4.7	18	7.2	21	9.7	23	12.2	12	1.48	2
23	6	4.8	9	7.3	32	9.8	22	12.3	11	1.49	6
24	8	4.9	34	7.4	27	9.9	26	12.4	2	1.50	6
25	23	5.0	34	7.5	22	10.0	18	12.5	6	1.51	4
26	13	5.1	24	7.6	20	10.1	15	12.7	6	1.52	2
27	11	5.2	42	7.7	13	10.2	8	12.8	6	1.53	2
28	17	5.3	42	7.8	14	10.3	6	12.9	4	1.54	2
29	14	5.4	14	7.9	27	10.4	11	13.0	19	1.55	2
30	18	5.5	37	8.0	14	10.5	8	13.1	16	1.56	2
31	16	5.6	22	8.1	15	10.6	6	13.2	45	1.57	10
32	23	5.7	30	8.2	22	10.7	2	13.3	37	1.59	4
									160	161	4
									161	162	2

WING 6, H.P. TETRAXIAL TENSILE STRAIN AT MAX STRESS, CHS=1750 IN/MIN, 800 PSI

This sample size summary is applicable to figures 16 thru 20

$Y = ((+3.1149259E-01) + (-1.2423929E-04) \times X)$
 $F = +8.9411780E+01$ $F = \text{SIGNIFICANT}$
 $R = -1.8172731E-01$ $R = \text{SIGNIFICANT}$
 $L = +9.4557802E+00$ $L = \text{SIGNIFICANT}$
 $N = 2620$ $\text{DEGREES OF FREEDOM} = 2618$
 $\text{STORAGE CONDITIONS} = \text{AMB TEMP/RH}$

$\text{PARAMETER} = \text{STRAIN AT MAX STRESS}$
 $\text{UNIT OF MEASURE} = \text{IN/IN}$
 $0.20 \quad 0.24 \quad 0.28 \quad 0.32 \quad 0.36 \quad 0.40$

HING 6.H.R. TRIAXIAL TENSILE STRAIN AT MAX STRESS, CHS=1750 IN/MIN, 800 PSI

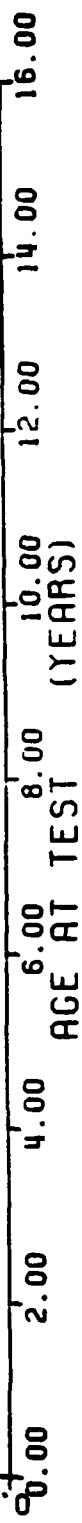


Figure 16

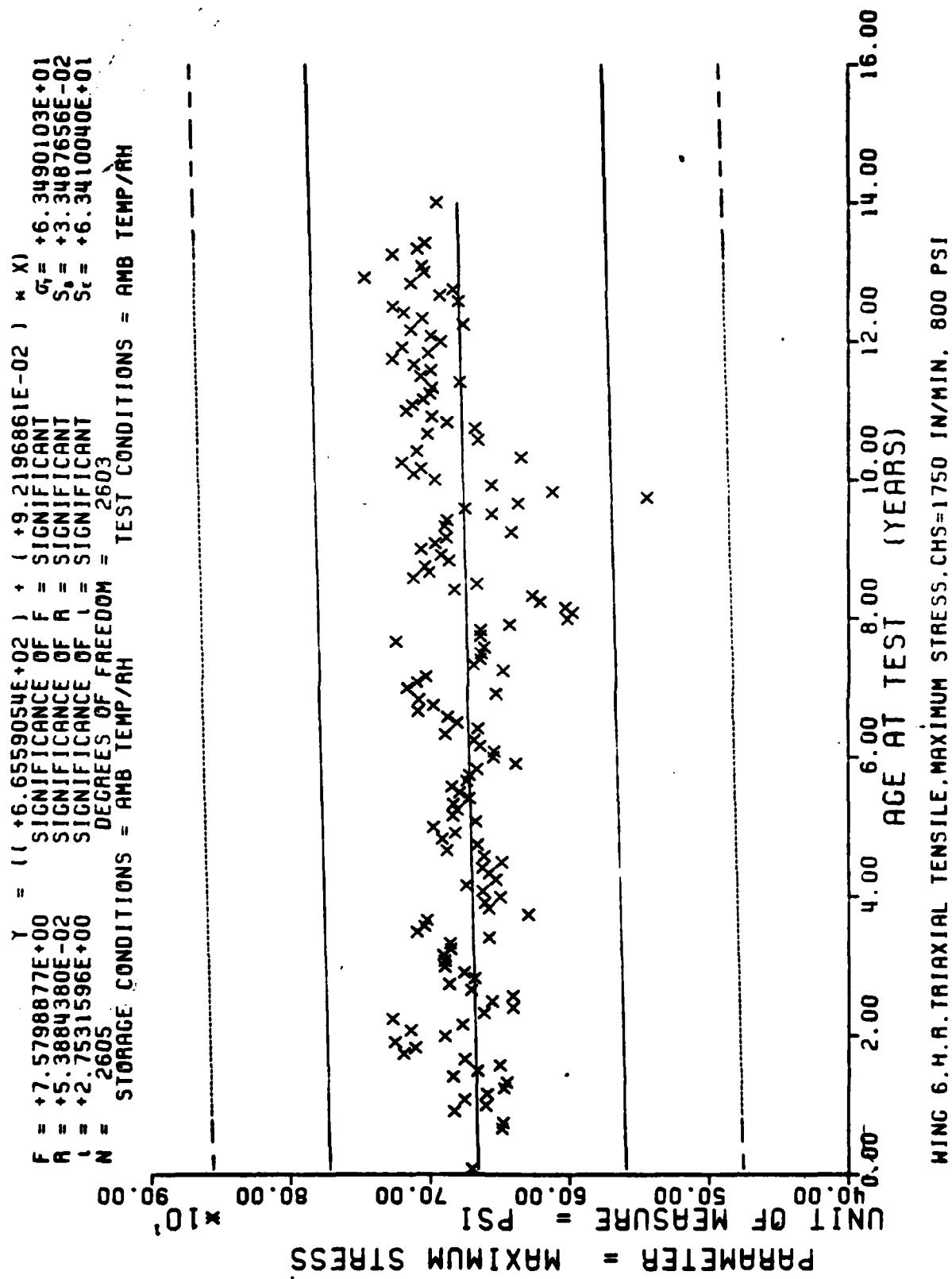


Figure 17

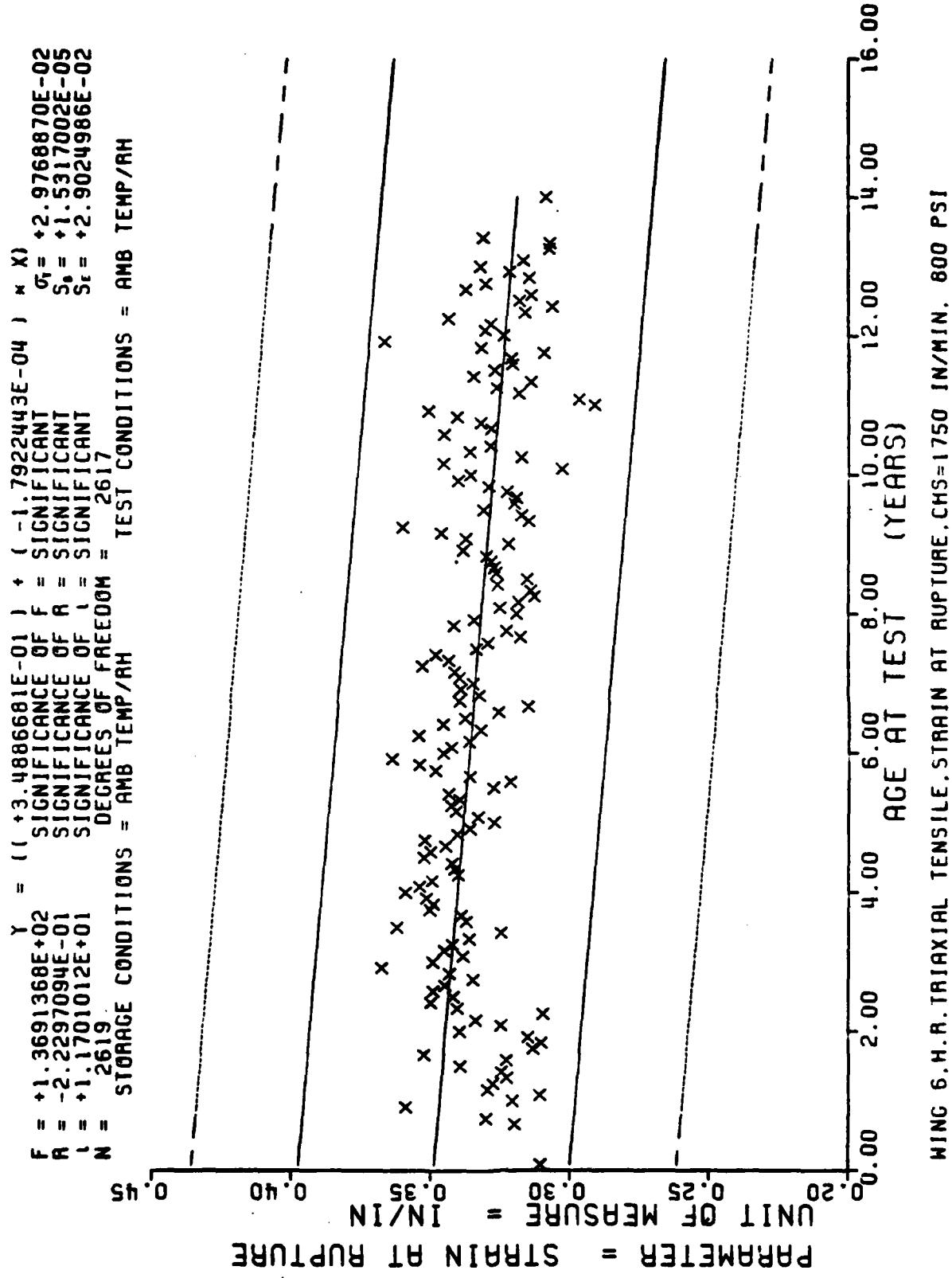
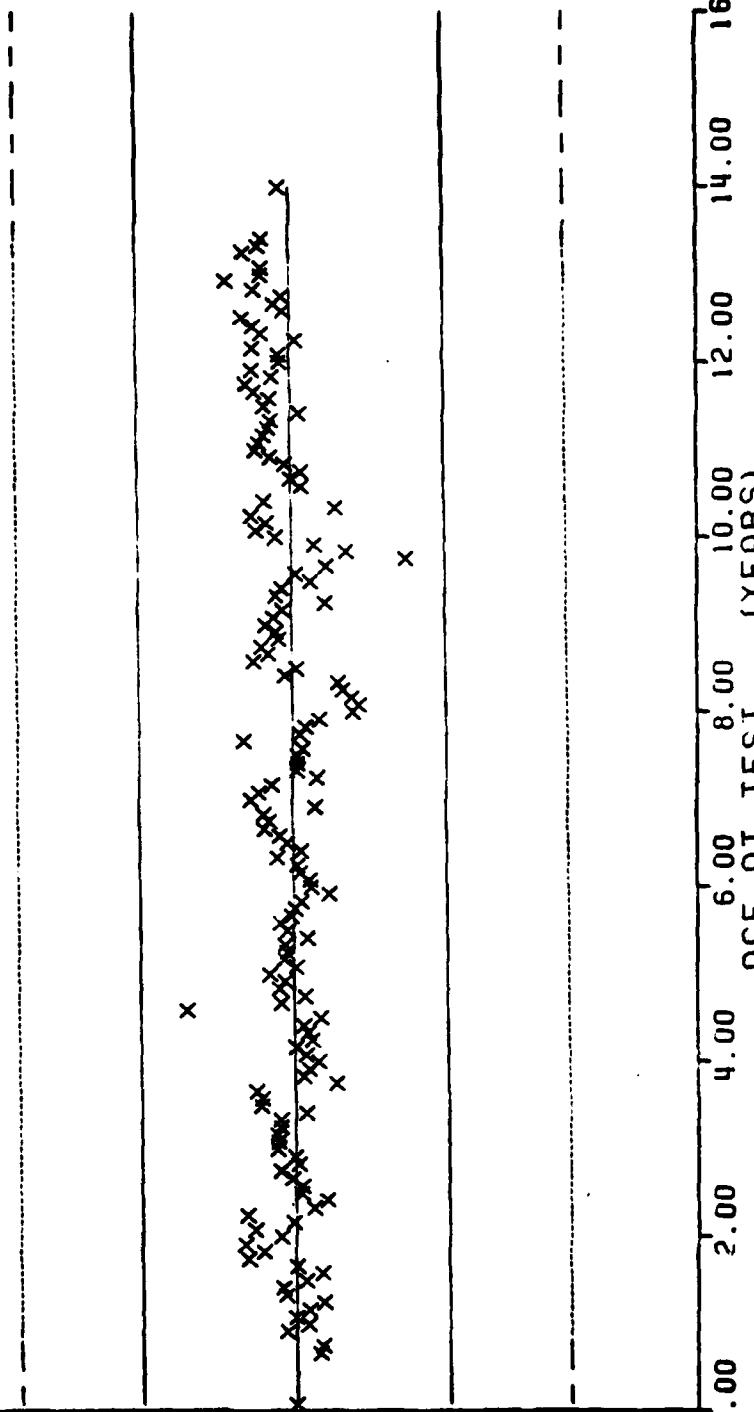


Figure 18

$Y = ((+6.5652201E+02) + (+4.9727324E-02) \times X)$
 $F = +8.1448878E-01$ SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma_t = +1.0441244E+02$
 $R = +1.7635597E-02$ SIGNIFICANCE OF R = NOT SIGNIFICANT $S_0 = +5.500119E-02$
 $\epsilon = +9.0249032E-01$ SIGNIFICANCE OF ϵ = NOT SIGNIFICANT $S_c = +1.0441614E+02$
 $N = 2620$ DEGREES OF FREEDOM = 2618 TEST CONDITIONS = AMB TEMP/RH

STORAGE CONDITIONS = AMB TEMP/RH

UNIT OF MEASURE = PSI
 PARAMETER = STRESS AT RUPTURE



WING 6. H.R. TRIAXIAL TENSILE STRESS AT RUPTURE. CHS=1750 IN/MIN. 800 PSI

Figure 19

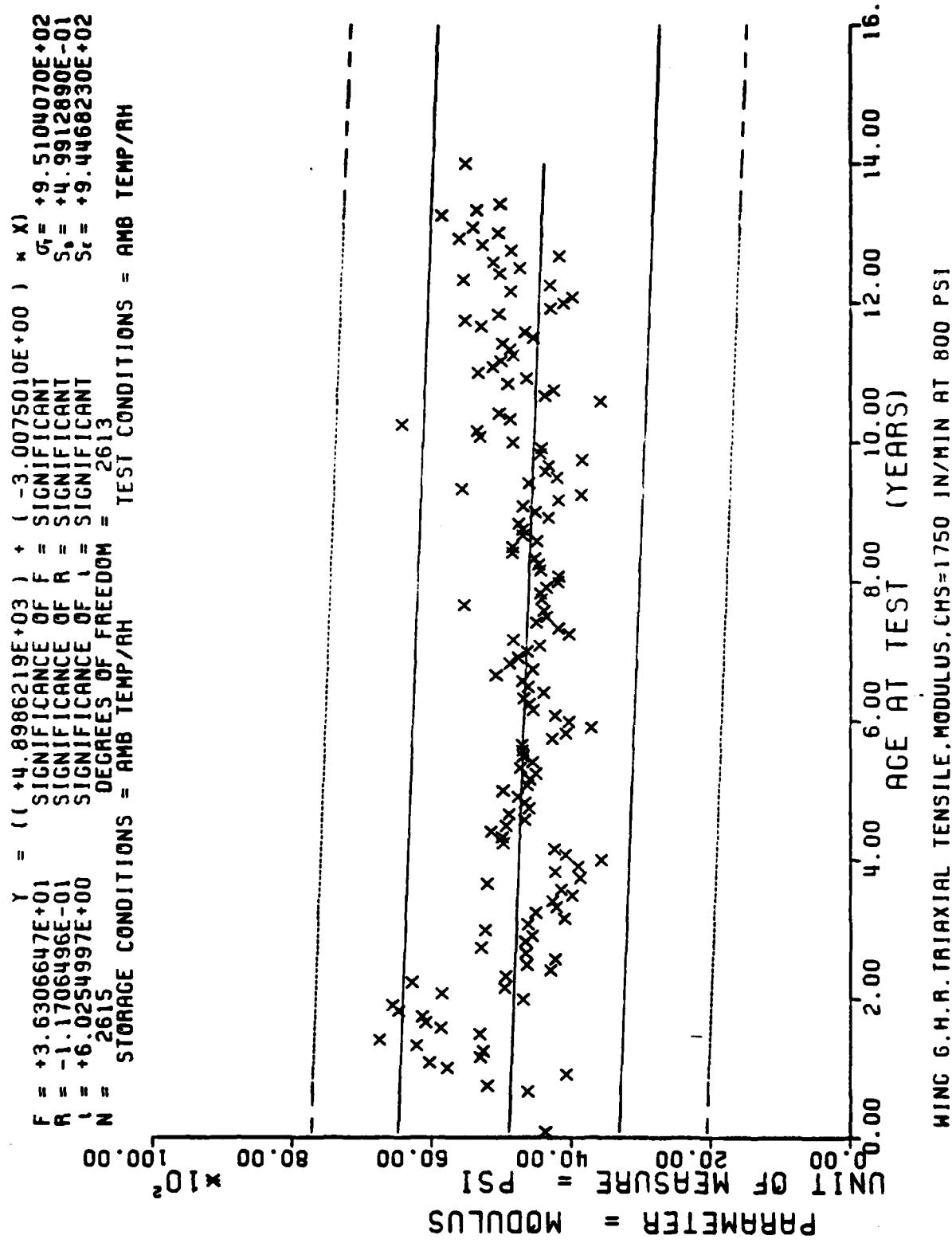


Figure 20

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP										
9	2	35	7	60	38	85	15	110	40	135	13
11	12	36	26	61	45	86	11	111	17	136	10
12	12	37	26	62	68	87	27	112	12	137	21
13	18	38	24	63	120	88	23	113	81	138	51
14	4	39	34	64	43	89	46	114	57	139	65
15	12	40	11	65	41	90	50	115	29	140	6
16	8	41	21	66	16	91	30	116	32	141	12
17	12	42	7	67	22	92	18	117	120	142	17
18	14	43	7	68	68	93	28	118	31	143	8
19	4	44	12	69	47	94	31	119	34	144	19
20	4	45	5	70	49	95	21	120	48	145	14
21	24	46	9	71	40	96	29	121	25	146	30
22	4	47	10	72	38	97	34	122	6	147	10
23	2	48	4	73	73	98	29	123	19	148	7
24	16	49	28	74	49	99	17	124	14	149	9
25	24	50	26	75	41	100	16	125	34	150	8
26	12	51	57	76	29	101	23	126	16	151	2
27	31	52	100	77	19	102	9	127	24	152	2
28	20	53	49	78	30	103	7	128	28	153	4
29	37	54	16	79	63	104	24	129	12	154	4
30	28	55	43	80	20	105	9	130	23	155	5
31	29	56	50	81	17	106	11	131	28	156	2
32	42	57	52	82	24	107	12	132	32	157	5
33	24	58	54	83	23	108	12	133	11	158	8
34	21	59	24	84	8	109	23	134	34	161	6
										168	2

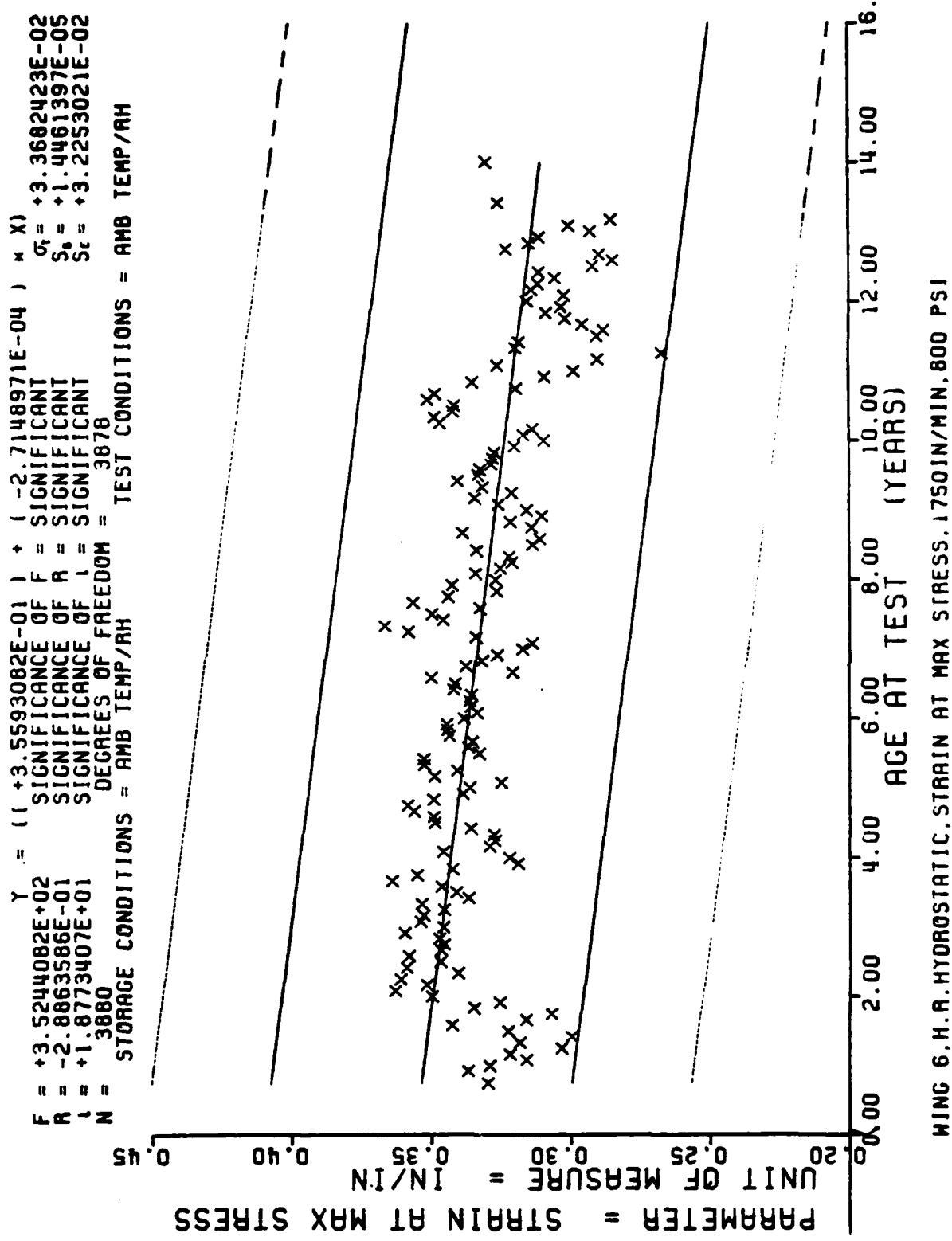


Figure 21

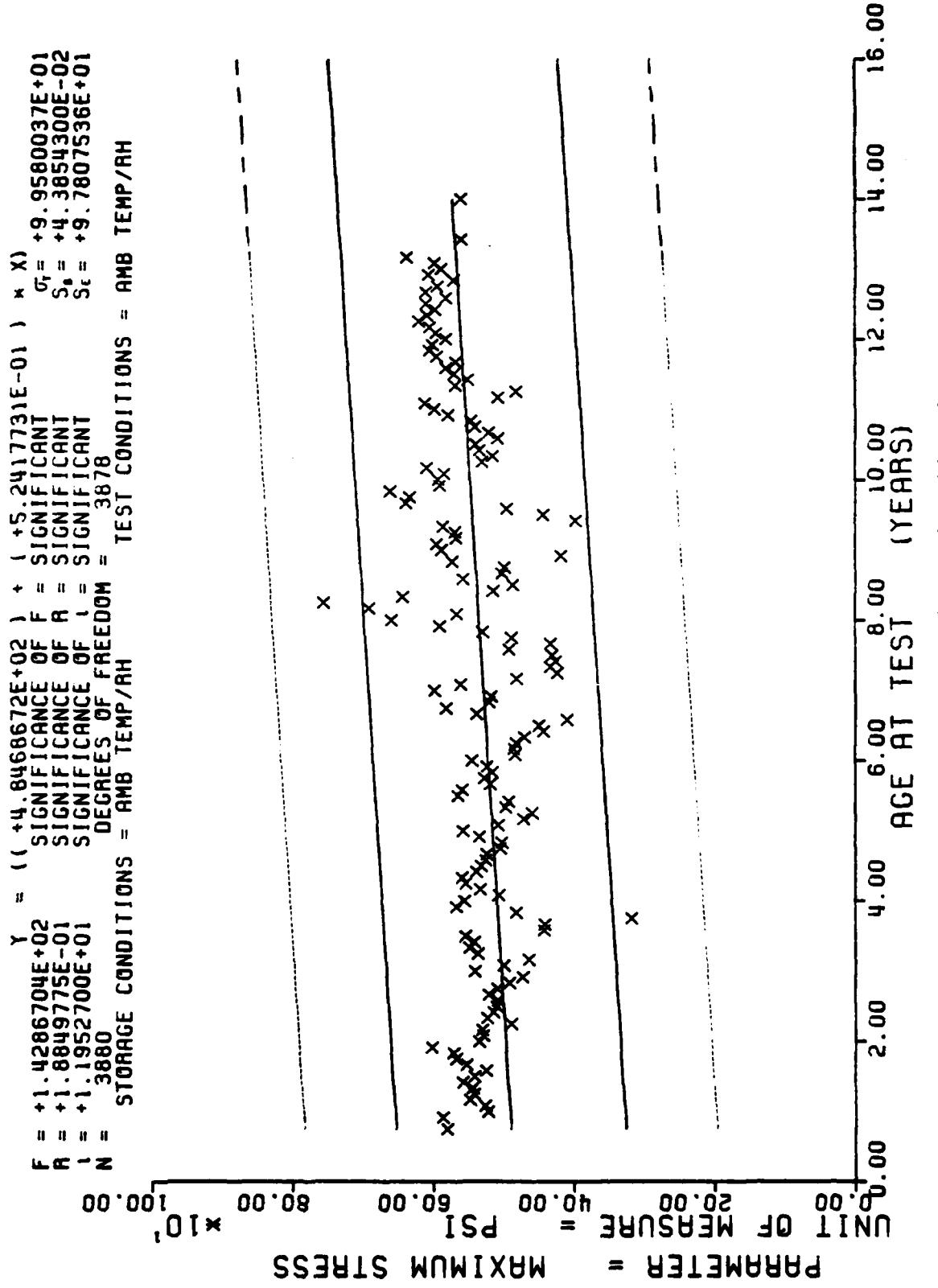
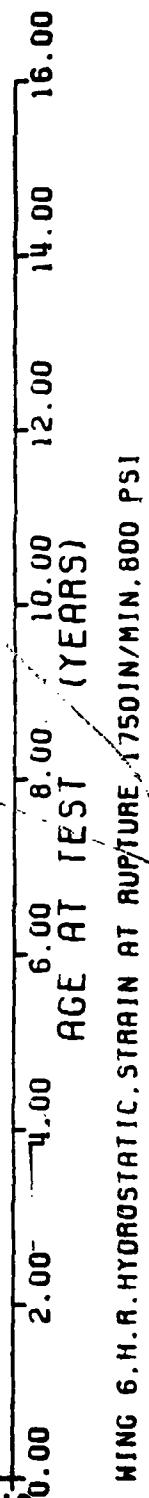


Figure 22

$F = +3.4400172E+02$ $\gamma = ((+4.2534421E-01) + (-2.9979646E-04) \times X)$
 $F = -2.8551175E-01$ $F = \text{SIGNIFICANT}$
 $R = +1.8547283E+01$ $R = \text{SIGNIFICANT}$
 $L = 3878$ $L = \text{SIGNIFICANT}$
 $N = 3876$ $\text{DEGREES OF FREEDOM} = 3876$
 $\text{STORAGE CONDITIONS} = \text{AMB TEMP/RH}$ $\text{TEST CONDITIONS} = \text{AMB TEMP/RH}$

$\text{PARAMETER} = \text{STRAIN AT RUP/TURE}$
 $\text{UNIT OF MEASURE} = \text{IN/IN}$
 $0.24 \quad 0.32 \quad 0.40 \quad 0.48 \quad 0.56 \quad 0.64$



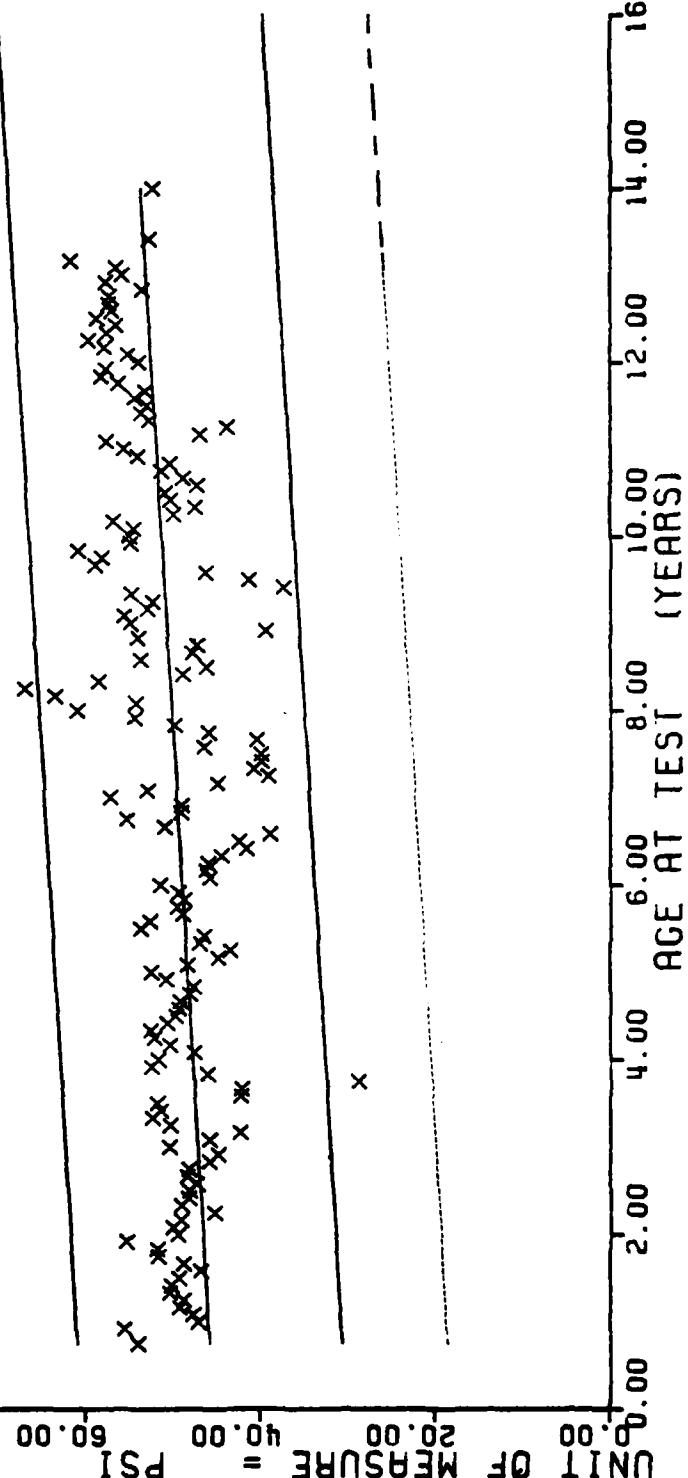
WING 6, H.R. HYDROSTATIC, STRAIN AT RUP/TURE, 1750 IN/MIN, 800 PSI

Figure 23

$F = +1.4898270E+02$ $\gamma = ((+4.5365227E+02) + (+4.9697336E-01) \times X)$
 $R = +1.9234373E-01$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +1.92205847E+01$ SIGNIFICANCE OF R = SIGNIFICANT
 $\sigma = +1.2205847E+01$ SIGNIFICANCE OF σ = SIGNIFICANT
 $N = 3880$ DEGREES OF FREEDOM = 3878
 $N =$ STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

PARAMETER = STRESS AT RUPTURE

UNIT OF MEASURE = PSI $40.00 \quad 60.00 \quad 80.00 \quad 100.00$

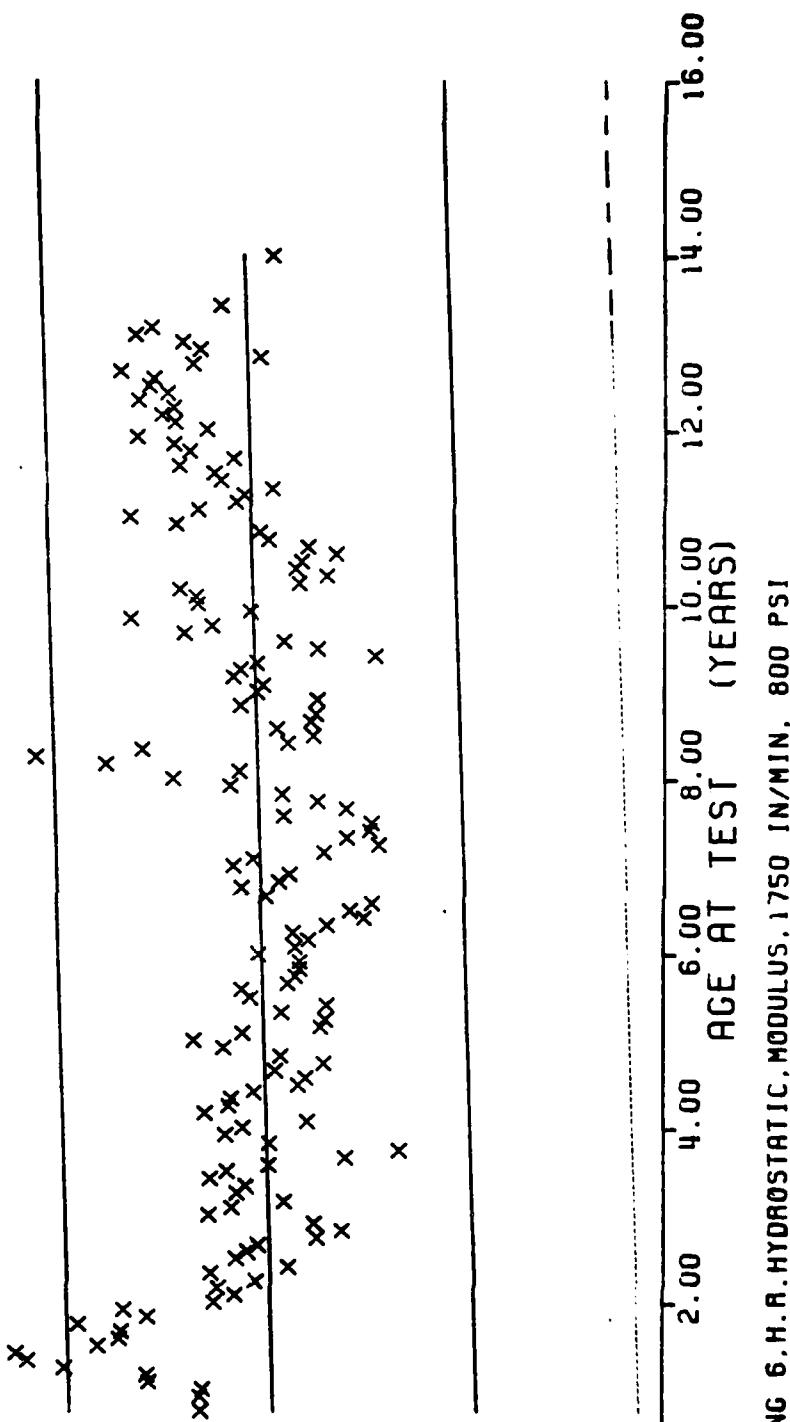


WING 6.H.R. HYDROSTATIC, STRESS AT RUPTURE, 1750 IN/MIN, 800 PSI

Figure 24

$F = +1.3588322E+01$ $\gamma = (+3.4209446E+03) + (+2.3009328E+00) \times X$
 $F = \text{SIGNIFICANCE OF } F$ $F = \text{SIGNIFICANT}$
 $R = +5.9098340E-02$ $R = \text{SIGNIFICANCE OF } R$
 $I = +3.6862341E+00$ $I = \text{SIGNIFICANCE OF } I$
 $N = 3879$ $N = \text{DEGREES OF FREEDOM} = 3877$
 $\text{STORAGE CONDITIONS} = \text{AMB TEMP/RH}$ $\text{TEST CONDITIONS} = \text{AMB TEMP/RH}$

UNIT OF MEASURE = PSI $\times 10^2$
 PARAMETER = MODULUS



WING 6. H.R. HYDROSTATIC MODULUS, 1750 IN/MIN, 800 PSI

Figure 25

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP
26	13
31	12
36	11
56	5
57	13
59	14
65	12
91	7
94	14
120	12
121	12

STAGE I WING C TP-H1011 1YEAR ENERGY TFSST/TFSMP=77 DFG F

This sample size summary is applicable to figure 26

$Y = ((+1.2718053E+00) + (-2.9404487E-03) * X)$
 $F = +7.3959993E+00$ SIGNIFICANT $\sigma_f = +4.0501268E-01$
 $R = -2.3815861E-01$ SIGNIFICANT $S_r = +1.0812227E-03$
 $\alpha = +2.7195586E+00$ SIGNIFICANT $S_\alpha = +3.9495474E-01$
 $N = 125$ DEGREES OF FREEDOM = 123 TEST CONDITIONS = 77 DEG/F AMB-RH

PARAMETER = COHESIVE ENERGY
 UNIT OF MEASURE = IN-LB/INXIN
 3.20
 2.80
 2.40
 2.00
 1.60
 1.20
 0.80
 0.40
 0.00

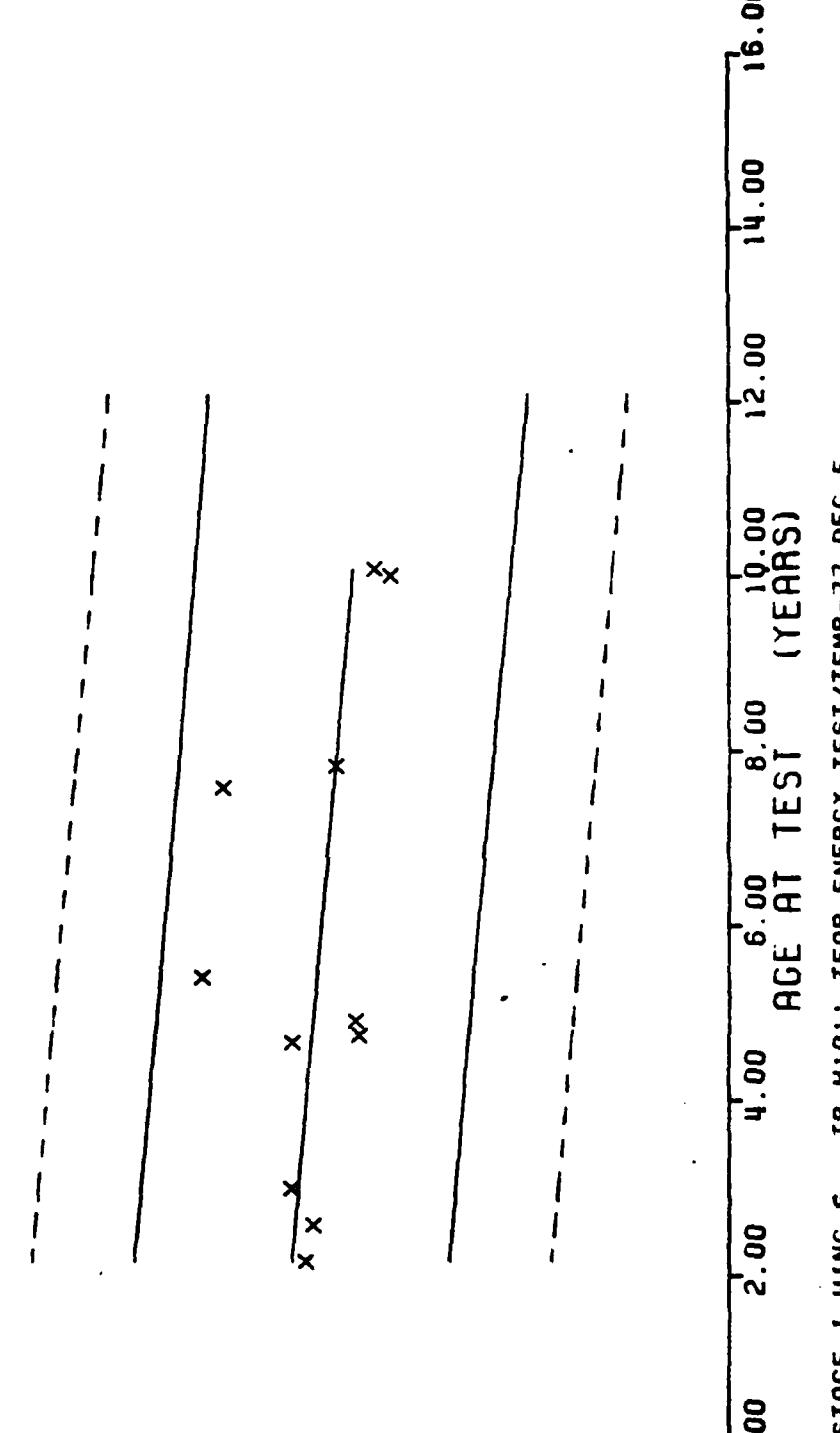


Figure 26

*** SAMPLE SIZE SUMMARY ***

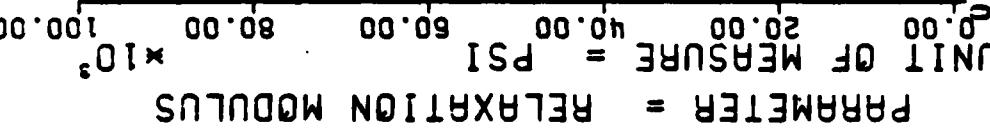
AGE (MOS)	NR SAMP								
12	2	42	6	67	9	92	6	117	27
13	3	43	12	68	9	93	25	118	21
15	1	44	3	69	20	94	26	119	19
16	3	45	6	70	30	95	26	120	39
17	4	46	3	71	41	96	51	121	21
19	4	47	6	72	30	97	54	122	6
21	4	48	6	73	39	98	55	123	9
22	4	49	2	74	32	99	41	124	27
24	5	50	26	75	32	100	23	125	20
25	5	51	49	76	17	101	27	126	21
26	6	52	46	77	40	102	6	127	15
27	3	53	18	78	28	103	16	128	23
29	3	54	27	79	15	104	12	129	2
30	3	55	27	80	17	105	9	130	76
31	3	56	21	81	23	106	3	131	42
32	6	57	24	82	35	107	9	132	8
33	6	58	20	83	12	108	15	133	21
34	3	59	9	84	17	109	15	134	31
35	6	60	5	85	18	110	9	135	18
36	1	61	21	86	9	111	6	136	2
37	9	62	46	87	33	112	17	137	12
38	6	63	23	88	19	113	51	138	34
39	6	64	30	89	21	114	35	139	45
40	8	65	9	90	30	115	49	140	9
41	6	66	2	91	14	116	42	141	15
								171	3
								193	3

WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 10 SEC., -65 DEG F. TPH-1011

This sample size summary is applicable to figures 27 and 28

$F = +1.4511584E+02$
 $R = +2.3046653E-01$
 $I = +1.2046403E+01$
 $N = 2589$
 STORAGE CONDITIONS = AMB TEMP/RH

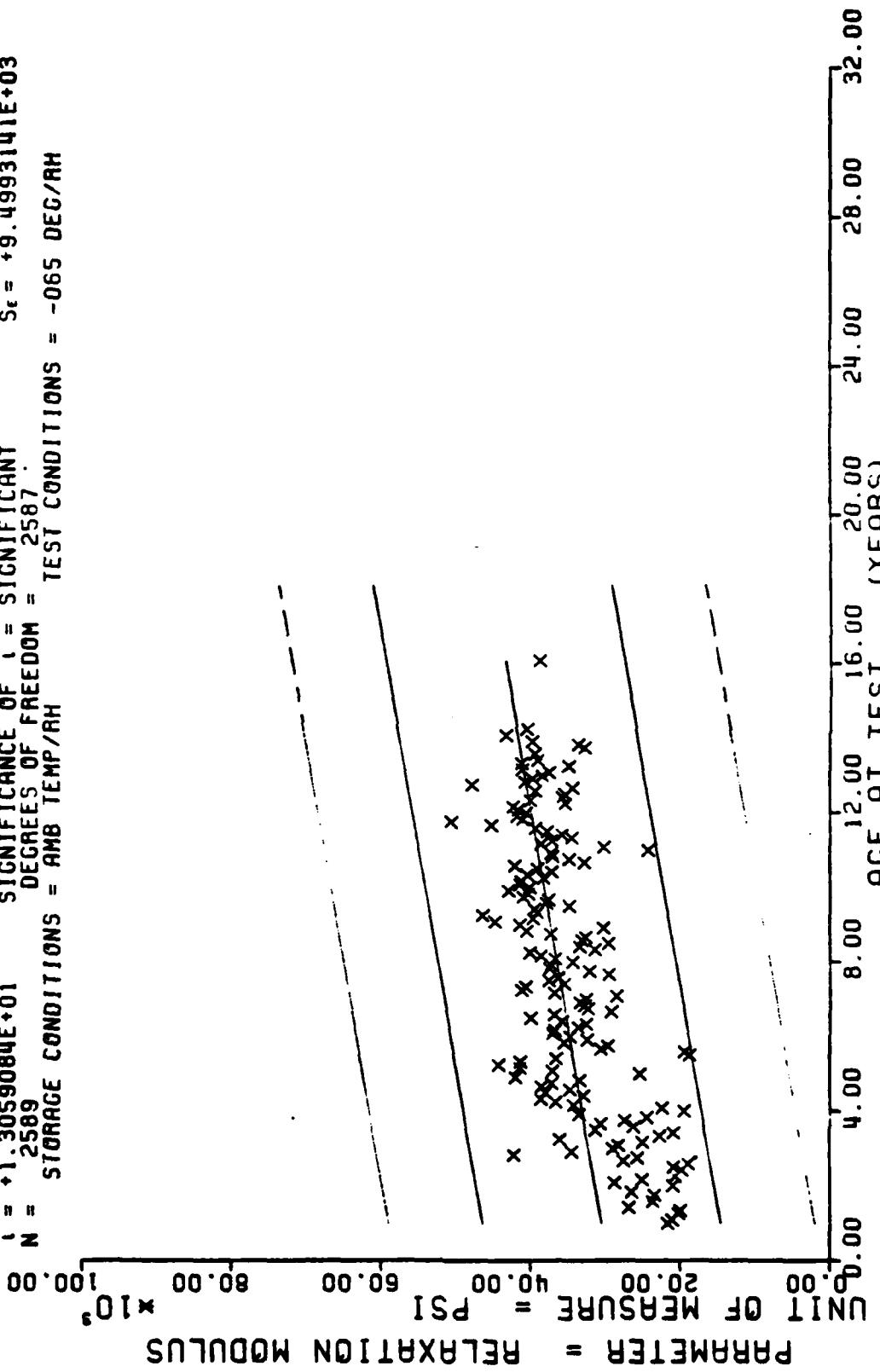
$\gamma = ((+3.5692837E+04) + (+7.4605632E+01) \times X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF I = SIGNIFICANT
 DEGREES OF FREEDOM = 2587
 TEST CONDITIONS = -065 DEG AMB RH



WING 6. STRESS RELAXATION MODULUS. 0.5% STRAIN, 10 SEC. -65 DEG F, TPH-1011

Figure 27

$F = +1.7053970E+02$ $\gamma = (1.9657148E+04) + (7.1140621E+01) \times X$
 $R = +2.4868629E-01$ SIGNIFICANCE OF F = SIGNIFICANT
 $\alpha = +1.3059084E+01$ SIGNIFICANCE OF R = SIGNIFICANT
 $N = 2589$ SIGNIFICANCE OF γ = SIGNIFICANT
 DEGREES OF FREEDOM = 2587
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -065 DEG/RH



*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGF (MOS)	NR SAMP	AGF (MOS)	NR SAMP	AGF (MOS)	NR SAMP	AGF (MOS)	NP SAMP
49	2	74	32	59	41	124	27	149	12
50	26	75	32	100	23	125	26	150	3
51	49	76	17	101	27	126	21	151	12
52	46	77	40	102	8	127	12	152	3
53	18	78	28	103	18	128	23	153	32
54	27	79	15	104	12	129	2	154	6
55	27	80	17	105	9	130	36	155	6
56	21	81	23	106	3	131	36	156	6
57	24	82	35	107	9	132	8	157	6
58	29	83	12	108	15	133	18	158	3
59	9	84	17	109	15	134	28	159	3
60	9	85	18	110	9	135	18	160	3
61	21	86	9	111	6	136	2	161	15
62	46	87	33	112	17	137	9	163	3
63	23	88	19	113	45	138	34	165	3
64	30	89	21	114	35	139	45	166	6
65	9	90	30	115	46	140	6	167	6
66	2	91	14	116	36	141	12	169	3
67	9	92	9	117	27	142	18	171	3
68	9	93	25	118	21	143	38	193	3
69	21	94	26	119	19	144	9		
70	30	95	26	120	36	145	3		
71	41	96	51	121	21	146	6		
72	30	97	54	122	6	147	9		
73	39	98	55	123	6	148	3		

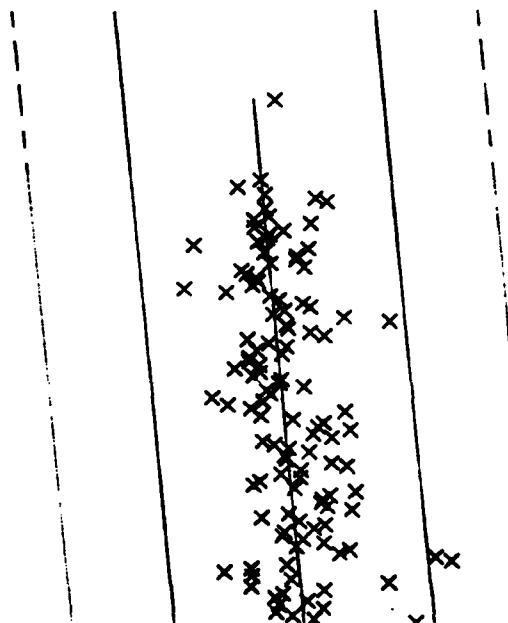
$F = +4.5335730E+01$ $\gamma = ((+3.0392575E+04) + (+3.9108005E+01) * X)$
 $R = +1.3577237E-01$ SIGNIFICANCE OF F = SIGNIFICANT
 $\alpha = +6.7331813E+00$ SIGNIFICANCE OF R = SIGNIFICANT
 $\beta = +6.7331813E+00$ SIGNIFICANCE OF α = SIGNIFICANT
 $N = 2416$ DEGREES OF FREEDOM = 2414
 $N =$ STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -065 DEG/RH

UNIT OF MEASURE = PSI $\times 10^3$
 PARAMETER = RELAXATION MODULUS

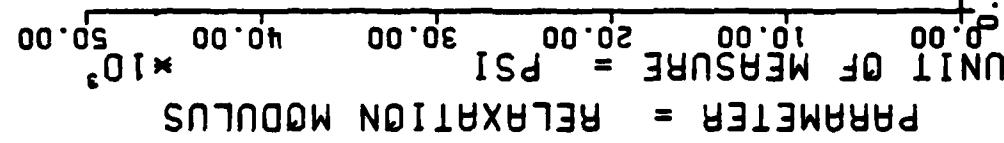
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WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 100 SEC, -65 DEG F. IPH-1011

Figure 29



$F = +1.2484611E+01$ $\gamma = ((+2.4023328E+04) + (+1.6594980E+01) \times X)$
 $R = +7.1729654E-02$ SIGNIFICANT
 $L = +3.5333569E+00$ SIGNIFICANT
 $N = 2416$ SIGNIFICANT
 $Degrees of Freedom = 2414$
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -065 DEG/RH



WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 1000 SEC. -65 DEG F, IPH-1011

Figure 30

*** SAMPLE SIZE SUMMARY ***

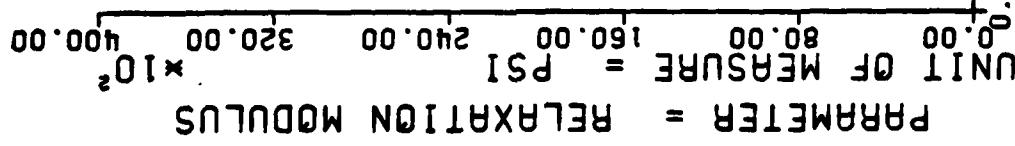
AGE (MOS)	NR SAMP										
12	3	41	2	66	6	91	18	116	49	141	15
13	3	42	9	67	6	92	24	117	21	142	30
15	3	43	9	68	12	93	18	118	21	143	40
16	3	44	3	69	21	94	22	119	15	144	9
17	7	45	6	70	30	95	21	120	32	145	6
18	3	46	3	71	44	96	57	121	21	146	3
20	3	47	9	72	36	97	66	122	6	147	12
21	6	48	3	73	35	98	54	123	11	148	3
23	3	49	6	74	24	99	42	124	16	149	12
24	2	50	27	75	28	100	21	125	16	150	3
25	6	51	51	76	29	101	24	126	19	151	15
26	7	52	47	77	36	102	6	127	47	152	6
27	2	53	14	78	35	103	21	128	20	153	6
29	8	54	30	79	15	104	15	129	1	154	9
30	3	55	16	80	19	105	9	130	33	155	6
31	6	56	12	81	24	106	3	131	51	156	9
32	3	57	27	82	33	107	9	132	9	157	9
33	6	58	19	83	9	108	16	133	15	158	6
34	6	59	9	84	24	109	12	134	43	159	6
35	3	60	12	85	21	110	9	135	15	160	9
36	18	61	20	86	15	111	6	136	3	161	15
37	9	62	48	87	30	112	21	137	18	163	3
38	5	63	24	88	23	113	59	138	41	165	3
39	6	64	24	89	21	114	37	139	51	166	6
40	12	65	5	90	29	115	60	140	9	167	6
										168	3
										171	3
										193	

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WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 10 SEC., -40 DEG F, TPH-1011

This sample size summary is applicable to figures 31 thru 34

$Y = (1 + 1.6344157E + 04) + (1 + 1.4408862E + 01) * X$
 $F = 3.2888994E + 01$ SIGNIFICANT
 $R = 1.1004473E - 01$ SIGNIFICANT
 $t = 5.7348926E + 00$ SIGNIFICANT
 $N = 2685$ DEGREES OF FREEDOM = 2683
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -40 DEG/RH



WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 10 SEC. -40 DEG F, IPH-1011

Figure 31

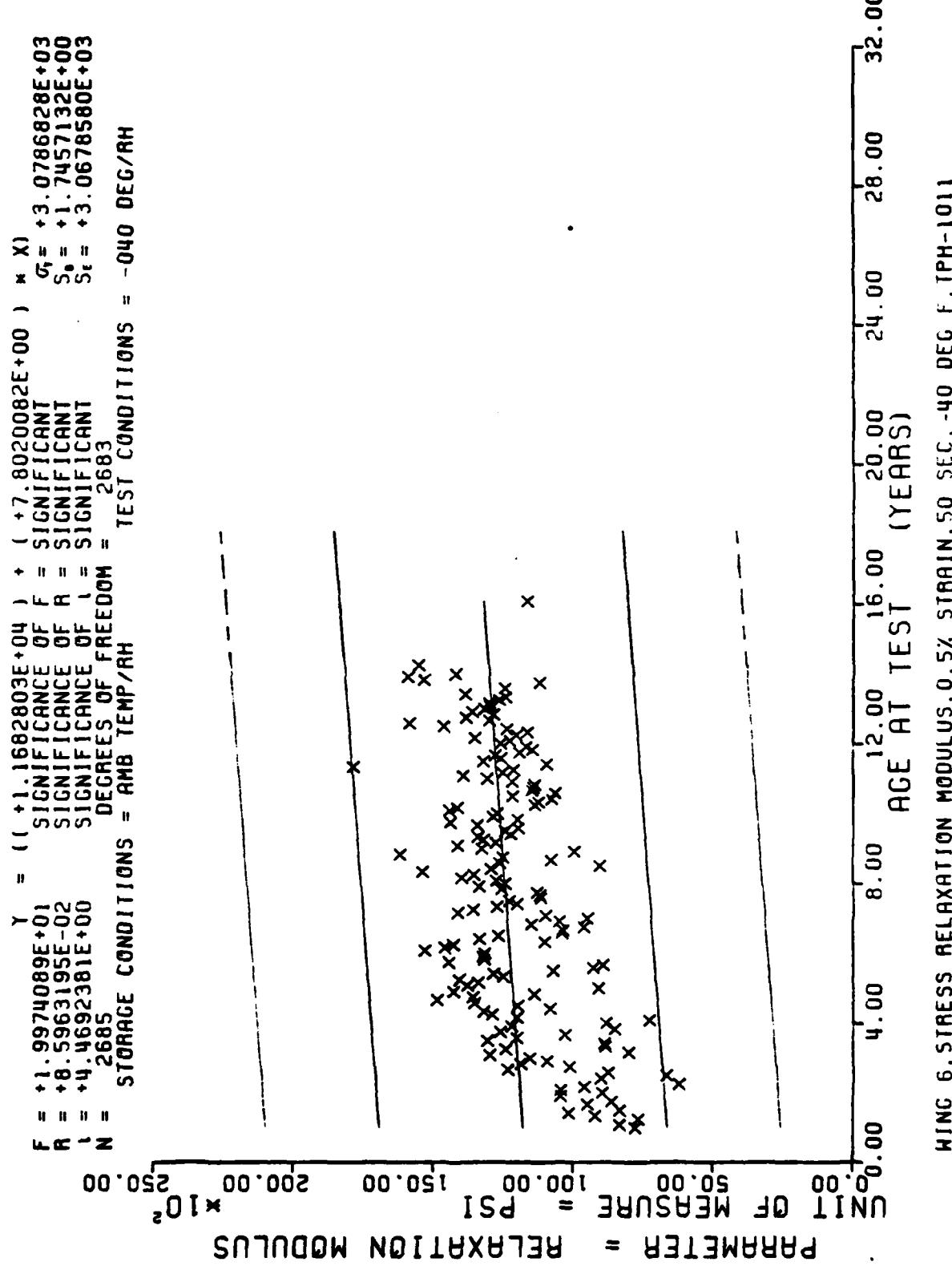


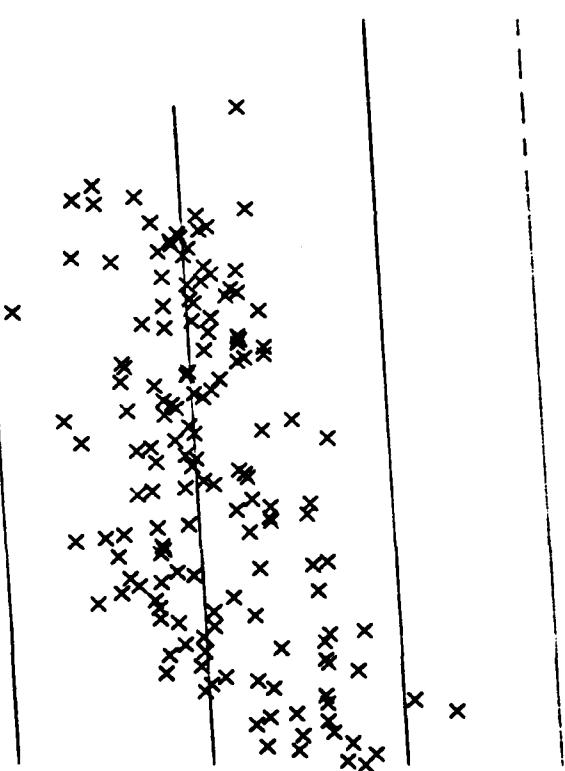
Figure 32

$F = +1.3934609E+01$ $y = ((+1.0239969E+04) + (+5.6461230E+00) \times x)$
 $R = +7.1880682E-02$ $\sigma_f = +2.6644602E+03$
 $\sigma_s = +1.5125263E+00$
 $\sigma_t = +2.6580631E+03$
 $\alpha = +3.7329089E+00$ $S_f = +1.5125263E+00$
 $N = 2685$ $S_s = +1.5125263E+00$
 $\text{DEGREES OF FREEDOM} = 2683$ $S_t = +2.6580631E+03$
 $\text{STORAGE CONDITIONS} = \text{AMB TEMP/RH}$ $\text{TEST CONDITIONS} = -040 \text{ DEG F/RH}$

PARAMETER = RELAXATION MODULUS

UNIT OF MEASURE = PSI $\times 10^2$

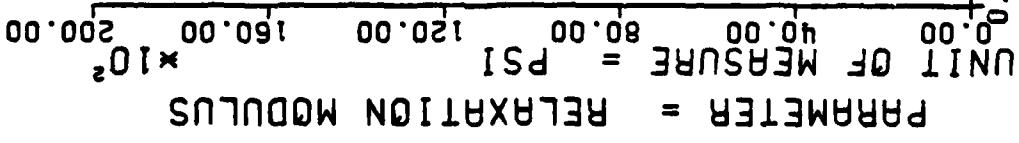
0.00 4.00 8.00 12.00 16.00 20.00 24.00 28.00 32.00



WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 100 SEC, -40 DEG F, I.PH-1011

Figure 33

$F = +2.5653759E+00$ $y = ((+6.7875679E+03) + (+1.5861992E+00) * x)$
 $R = +3.0907056E-02$ SIGNIFICANCE OF F = NOT SIGNIFICANT $S_f = +1.7408895E+03$
 $1 = +1.6016790E+00$ SIGNIFICANCE OF R = NOT SIGNIFICANT $S_0 = +9.9033526E-01$
 $N = 2685$ DEGREES OF FREEDOM = 2683 $S_e = +1.7403820E+03$
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -040 DEG/RH



WING 6. STRESS RELAXATION MODULUS, 0.5% STRAIN, 1000 SEC. -40 DEG F, TPH-1011

Figure 34

*** SAMPLE SIZE SUMMARY ***

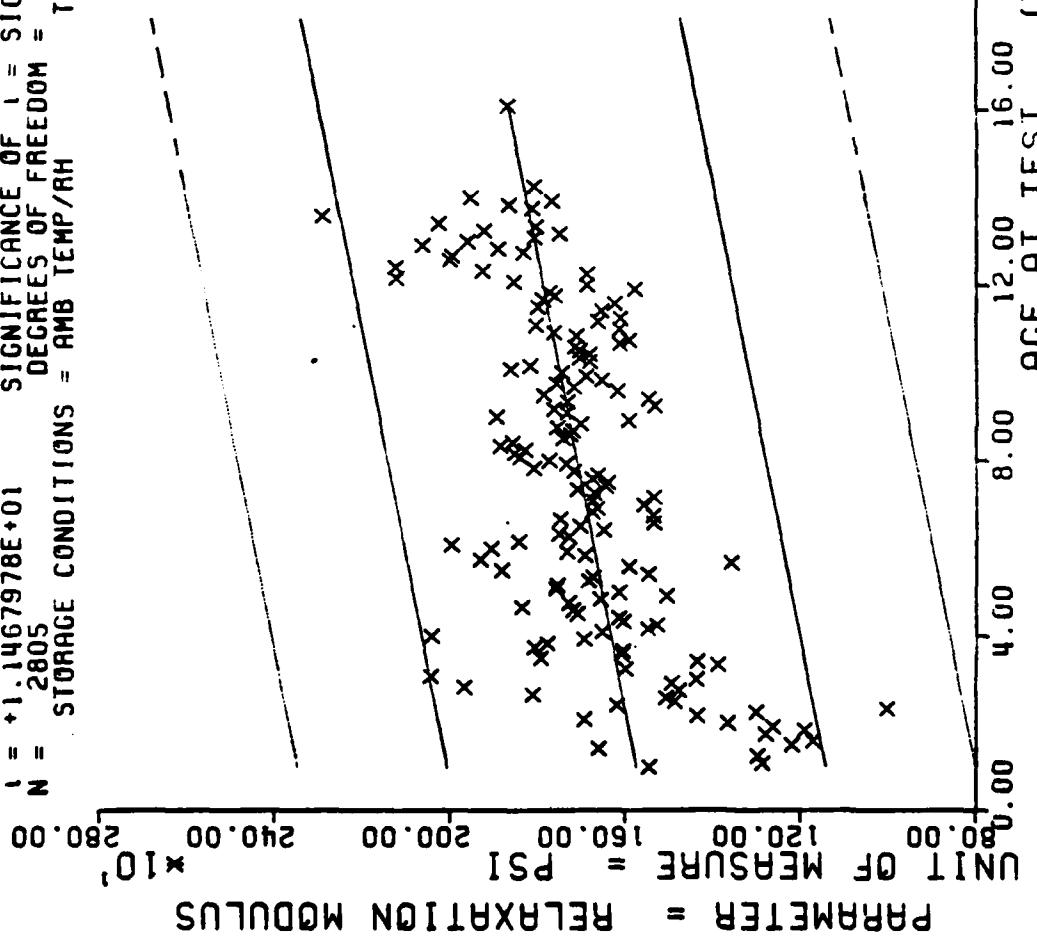
AGE (MOS)	NR SAMP								
12	3	41	3	66	9	91	21	116	51
13	3	42	15	67	10	92	21	117	21
15	6	43	9	68	9	93	21	118	21
17	7	44	3	69	29	94	21	119	27
18	3	45	6	70	24	95	32	120	30
19	9	46	6	71	46	96	57	121	21
21	5	47	9	72	42	97	57	122	9
22	6	48	3	73	24	98	54	123	12
23	6	49	6	74	39	99	42	124	23
24	6	50	27	75	38	100	21	125	18
25	6	51	59	76	26	101	27	126	20
26	6	52	48	77	37	102	8	127	14
27	6	53	15	78	36	103	21	128	24
28	3	54	32	79	18	104	5	129	3
29	6	55	18	80	24	105	9	130	33
30	3	56	18	81	39	106	3	131	54
31	9	57	30	82	27	107	12	132	15
32	3	58	16	83	15	108	18	133	9
33	12	59	6	84	27	109	9	134	42
34	6	60	22	85	12	110	9	135	15
35	9	61	21	86	21	111	6	137	18
36	24	62	49	87	26	112	36	138	26
37	5	63	24	88	24	113	53	139	66
39	12	64	27	89	24	114	41	140	12
40	8	65	12	90	36	115	46	141	12

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WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,10 SEC, 20 DEC F,TPH-1011

This sample size summary is applicable to figures 35 thru 38

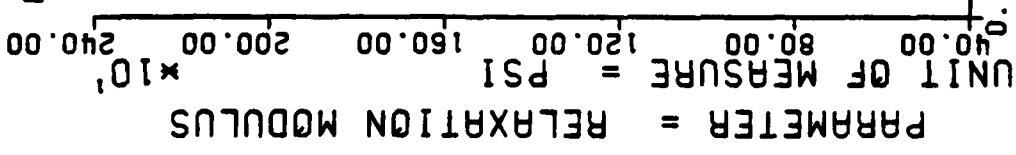
$F = +1.3151452E+02$ $y = ((+1.5552754E+03) + (+1.6173060E+00) * x)$
 $R = +2.1169896E-01$ $F = \text{SIGNIFICANT}$ $\sigma_t = +2.6360099E+02$
 $I = +1.1467978E+01$ $R = \text{SIGNIFICANT}$ $S_b = +1.4102800E-01$
 $N = 2805$ $I = \text{SIGNIFICANT}$ $S_t = +2.5767240E+02$
 $\text{DEGREES OF FREEDOM} = 2803$ $\text{TEST CONDITIONS} = +020 \text{ DEG/RH}$



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC. 20 DEG F. IPH-1011

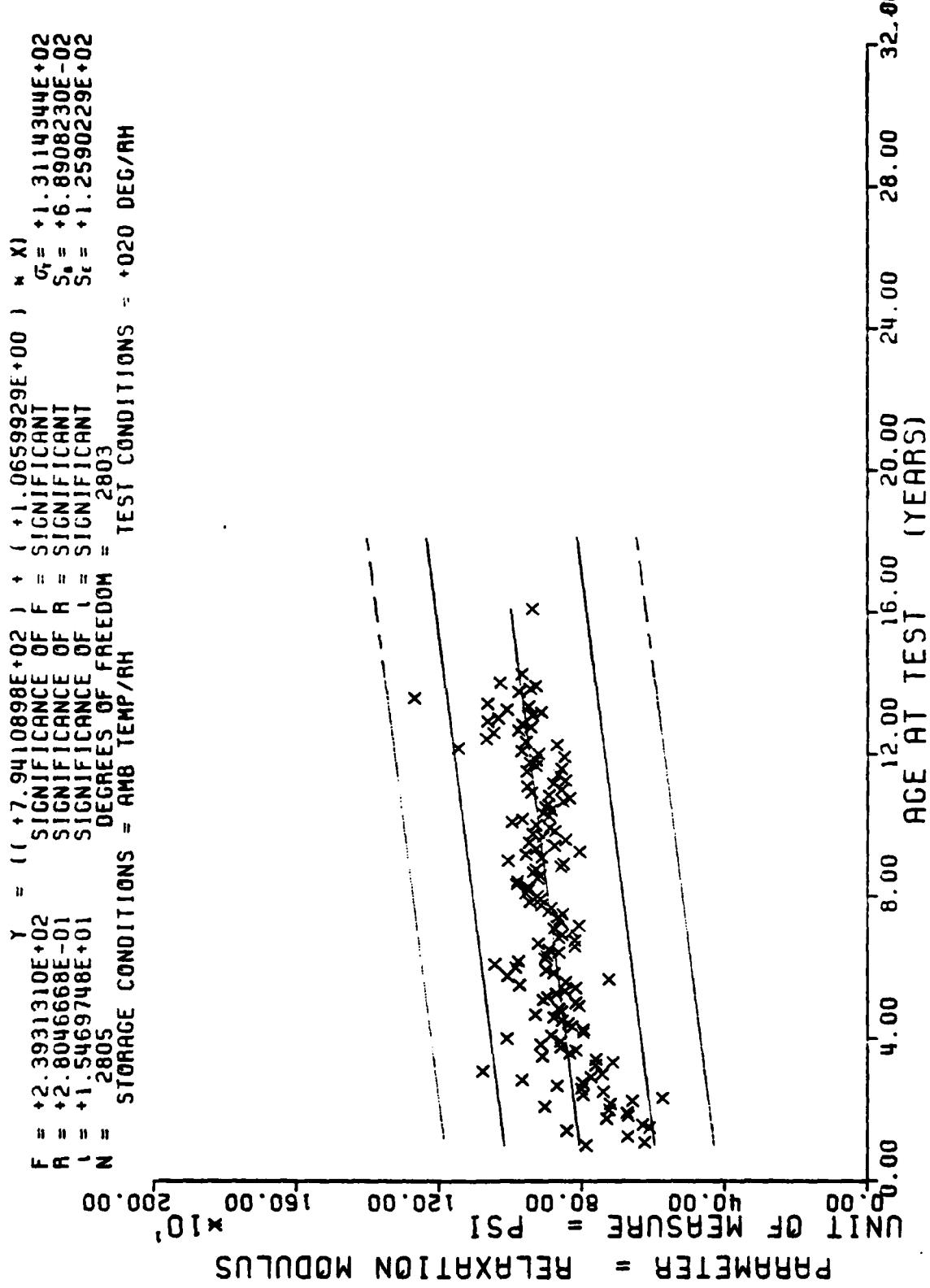
Figure 35

$\gamma = ((+9.3483930E+02) + (+1.2223193E+00) \times X)$
 $F = +2.2728425E+02$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +2.7386907E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $\alpha = +1.5075949E+01$ SIGNIFICANCE OF α = SIGNIFICANT
 $N = 2805$ DEGREES OF FREEDOM = 2803
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +020 DEG/RH



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC. 20 DEC F. I.PH-1011

Figure 36



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC. 20 DEG F. IPH-1011

Figure 37

$F = +1.2182681E+02$ $\gamma = ((+5.322883E+02) + (+5.3009305E-01) * X)$
 $A = +2.0408982E-01$ $F = \text{SIGNIFICANT}$ $\sigma_r = +8.9619867E+01$
 $A = +1.1037518E+01$ $F = \text{SIGNIFICANT}$ $S_a = +4.8026470E-02$
 $N = 2805$ $F = \text{SIGNIFICANT}$ $S_t = +8.7749211E+01$
DEGREES OF FREEDOM = 2803 TEST CONDITIONS = +020 DEG/RH

PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI
 $20.00 \quad 40.00 \quad 60.00 \quad 80.00 \quad 100.00 \quad 120.00$
 $20.00 \quad 40.00 \quad 60.00 \quad 80.00 \quad 100.00 \quad 120.00$

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WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC. 20 DEG F. TPH-1011

Figure 38

*** SAMPLE SIZE SUMMARY ***

AGE ^a (MOS)	NR SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NR SAMP
2	3	27	24	52	72	77	33	102	15	127	15
3	6	28	27	53	16	78	39	103	26	128	24
4	18	25	48	54	39	79	21	104	12	129	3
5	22	30	43	55	22	80	21	105	6	130	42
6	21	31	30	56	36	81	45	106	3	131	42
7	35	32	60	57	51	82	21	107	10	132	14
8	30	33	29	58	45	83	15	108	24	133	9
9	45	34	51	59	39	84	21	109	9	134	36
10	38	35	36	60	74	85	15	110	9	135	15
11	37	16	58	61	66	86	21	111	9	137	15
12	65	37	18	62	82	87	36	112	30	138	45
13	51	38	24	63	63	88	21	113	56	139	48
14	46	39	42	64	51	89	39	114	44	140	9
15	57	40	18	65	36	90	42	115	27	141	12
16	36	41	24	66	39	91	14	116	65	142	27
17	46	42	12	67	33	92	23	117	18	143	30
18	13	43	9	68	51	93	19	118	21	144	6
19	10	44	9	69	75	94	18	119	21	145	3
20	4	45	6	70	99	95	33	120	33	146	6
21	27	46	18	71	62	96	57	121	15	147	9
22	9	47	30	72	51	97	69	122	9	148	3
23	6	48	36	73	33	98	60	123	9	149	6
24	34	49	42	74	48	99	39	124	24	150	6
25	27	51	30	75	39	100	20	125	18	151	12
26	30	51	81	76	27	101	34	126	22	154	6
										156	6

WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 77 DEG F. TPH-1011

This sample size summary is applicable to figures 39 thru 42

184	3
192	1
193	2

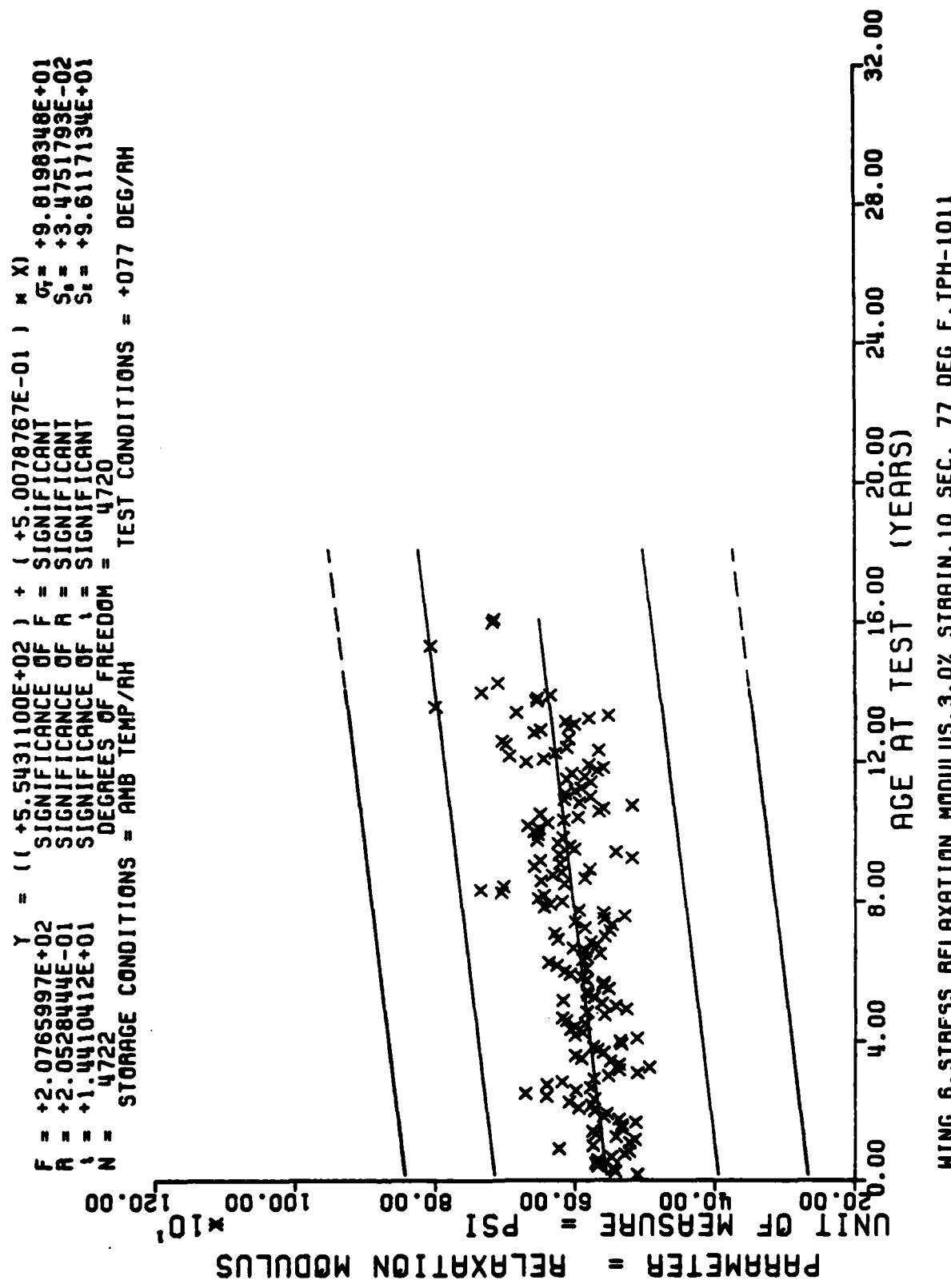


Figure 39

$\gamma = ((+4.4643051E+02) + (+4.0599915E-01) \times X)$
 $F = \text{SIGNIFICANT}$
 $R = \text{SIGNIFICANT}$
 $S = \text{SIGNIFICANT}$
 $S_r = \text{SIGNIFICANT}$
 $N = 4722$
 $\text{DEGREES OF FREEDOM} = 4720$
 $\text{STORAGE CONDITIONS} = \text{AMB TEMP/RH}$ TEST CONDITIONS = +077 DEG/RH

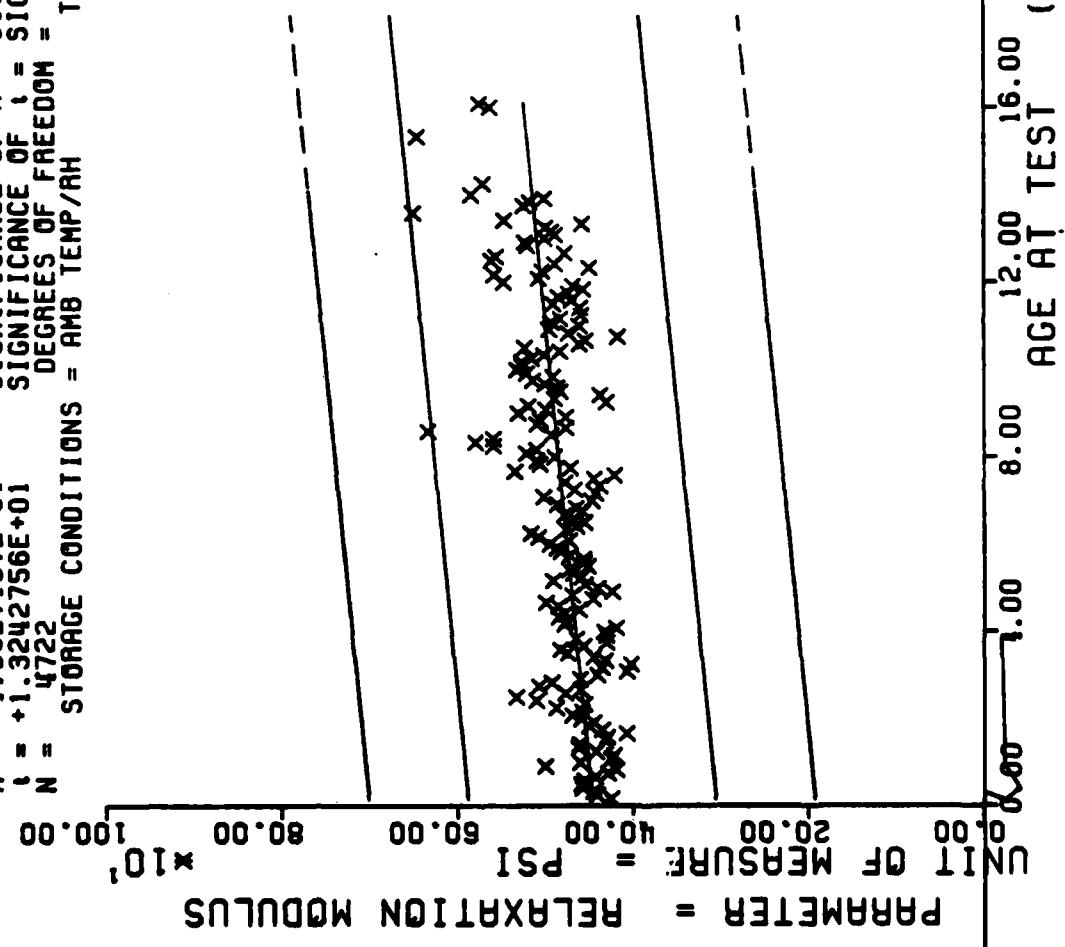


FIGURE 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC. 77 DEG F, TPH-1011

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH

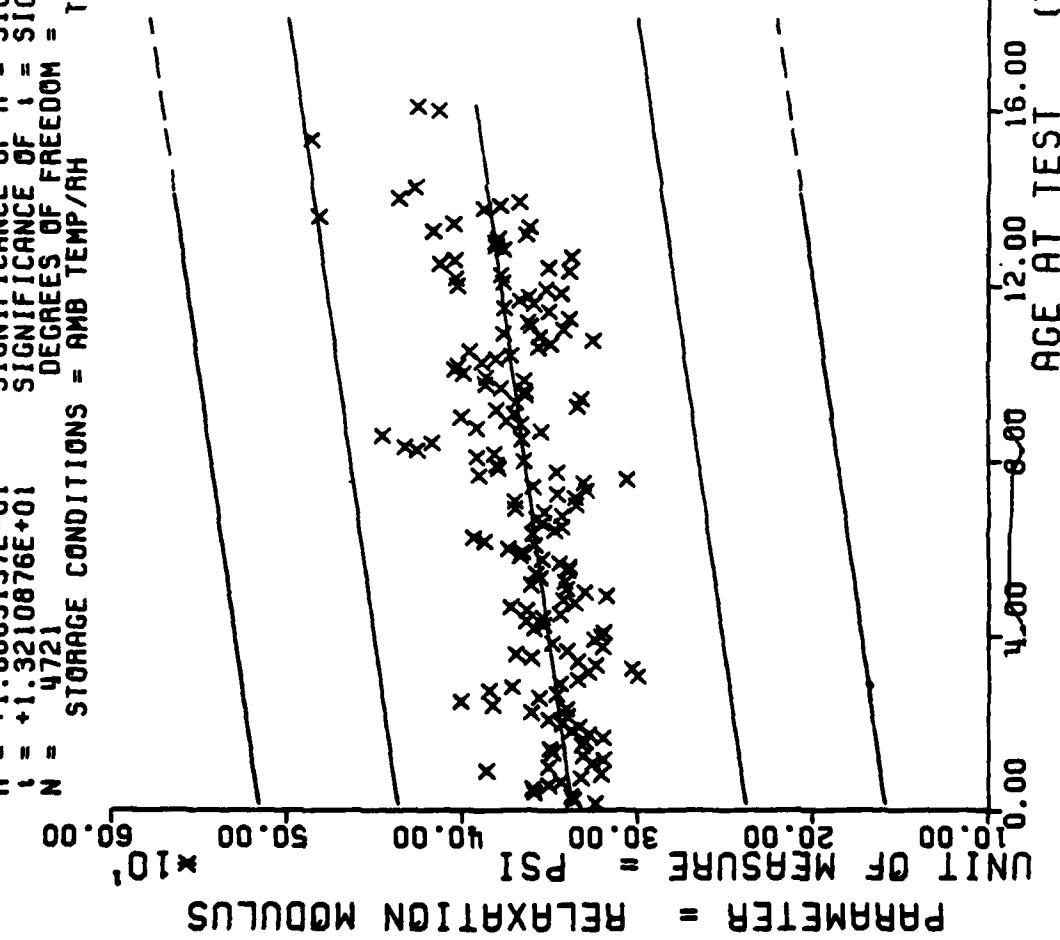
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI
0.00 20.00 40.00 60.00 80.00 100.00
 $\times 10^3$

PARAMETER = RELAXATION MODULUS

WING 6. STRESS RELAXATION MODULUS. 3.0% STRAIN. 1.00 SEC. 77 DEC F. I.P.H-1011

Figure 41

$F = +1.7452725E+02$ $F = (+3.3724062E+02) + (+2.8443214E-01) \times X$
 $R = +1.8885157E-01$ $F = \text{SIGNIFICANT}$
 $R = +1.3210876E+01$ $F = \text{SIGNIFICANT}$
 $N = 4721$ $R = \text{SIGNIFICANT}$
 $N = 4721$ $R = \text{SIGNIFICANT}$
 $N = 4721$ $Degrees of Freedom = 4719$
 $N = 4721$ $Test Conditions = +077 \text{ DEG/RH}$



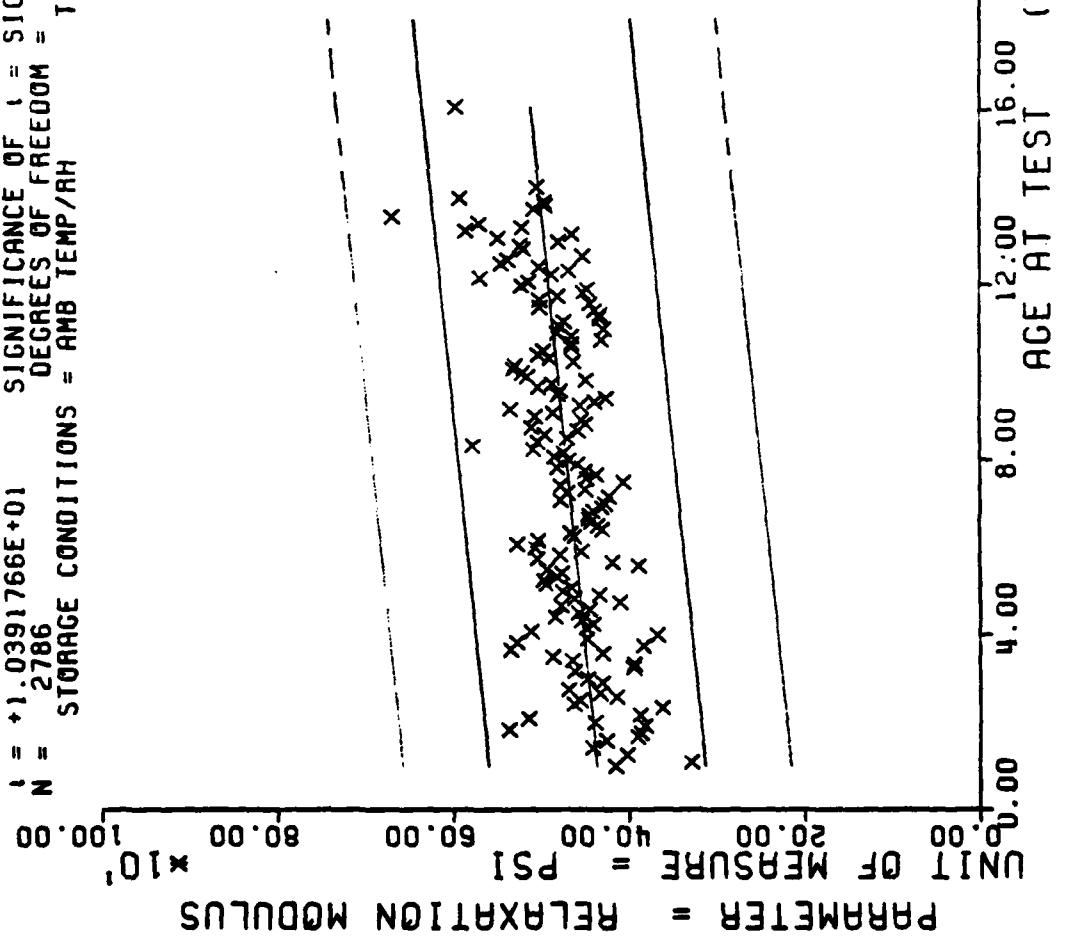
*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP								
12	3	43	9	68	12	93	21	118	21
13	3	44	3	69	24	94	21	119	21
15	6	45	9	70	27	95	27	120	36
17	15	46	6	71	48	96	60	121	18
19	6	47	9	72	42	97	57	122	9
20	3	48	3	73	24	98	60	123	15
21	6	49	6	74	42	99	39	124	21
22	6	50	27	75	36	100	21	125	15
23	3	51	57	76	29	101	24	126	24
24	6	52	45	77	33	102	9	127	14
25	9	53	12	78	36	103	21	128	21
26	9	54	28	79	18	104	9	129	3
28	3	55	27	80	24	105	9	130	42
29	9	56	27	81	39	106	3	131	45
30	9	57	31	82	27	107	8	132	9
31	3	58	24	83	18	108	21	133	15
32	6	59	12	84	21	109	9	134	39
33	9	60	15	85	12	110	9	135	12
35	15	61	20	86	18	111	9	136	6
36	24	62	48	87	18	112	33	137	21
38	6	63	21	88	14	113	51	138	51
39	9	64	33	89	18	114	44	139	51
40	9	65	9	90	30	115	30	140	21
41	12	66	12	91	24	116	36	141	18
42	6	67	6	92	24	117	21	142	27

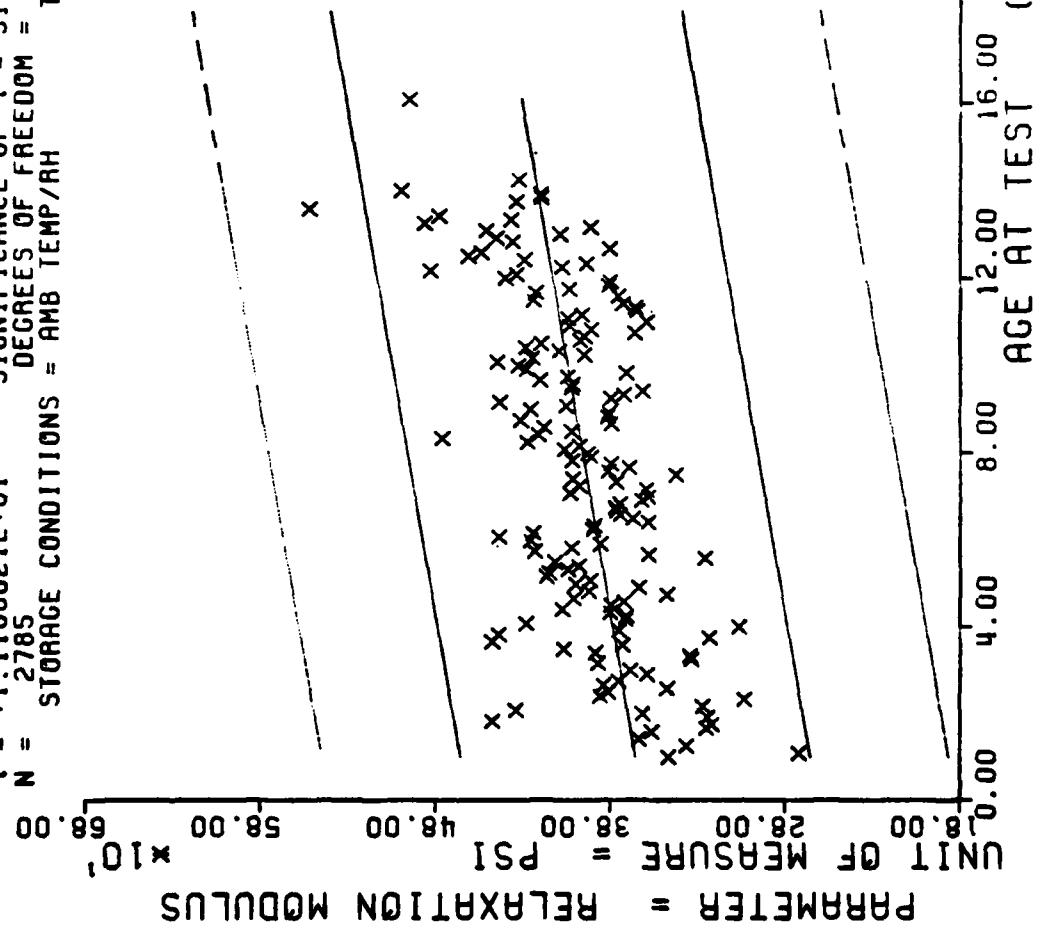
$F = +1.0798880E+02$
 $R = +1.9323734E-01$
 $t = +1.0391766E+01$
 $N = 2786$
 STORAGE CONDITIONS = AMB TEMP/RH

$\gamma = ((+4.3143682E+02) + (+4.1448105E-01) * X)$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 2784

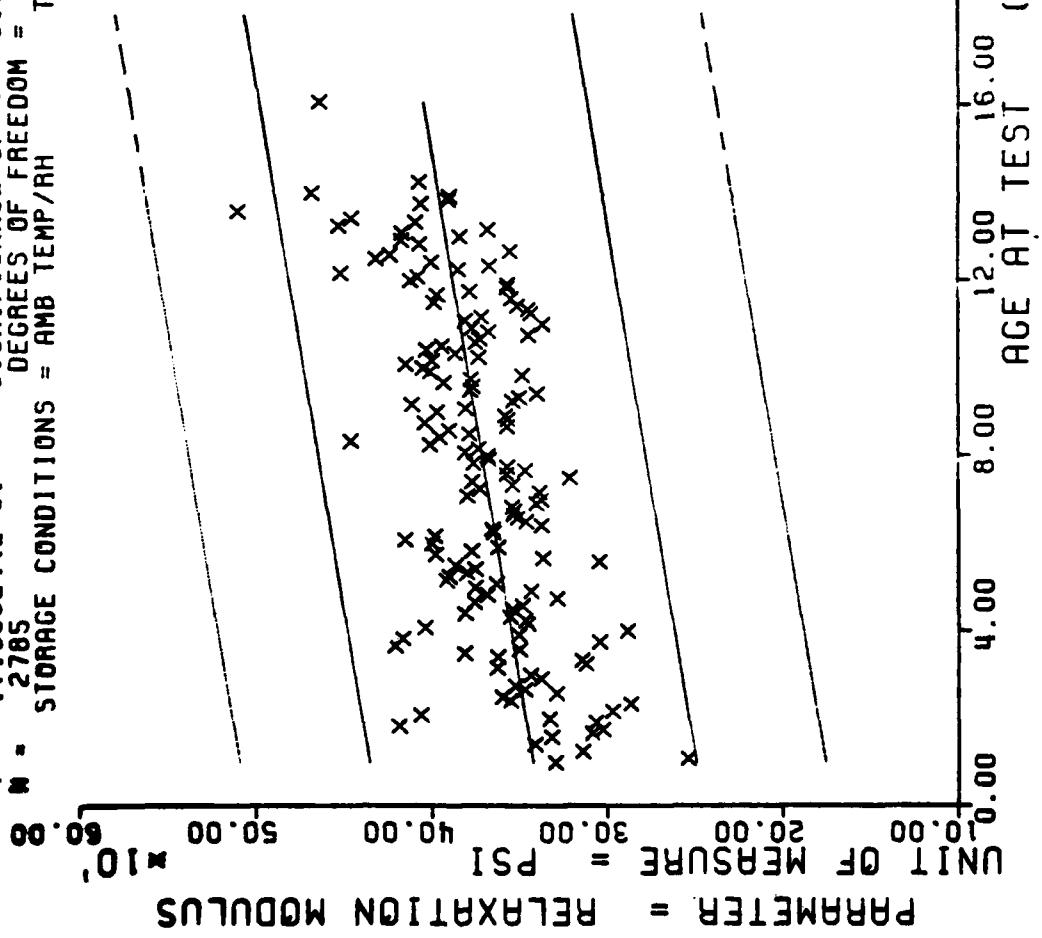
TEST CONDITIONS = +100 DEG/RH



$Y = ((+3.6126063E+02) + (+3.5905709E-01) * X)$
 $F = +1.2334371E+02$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +2.0600844E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $I = +1.1106021E+01$ SIGNIFICANCE OF I = SIGNIFICANT
 $N = 2785$ DEGREES OF FREEDOM = 2783
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +100 DEG/RH



$\gamma = ((+3.3835487E+02) + (+3.4173720E-01) * X)$
 $\gamma = 1.2896428E+02$ SIGNIFICANCE OF F = SIGNIFICANT
 $\gamma = 2.1044650E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $\gamma = 1.1356244E+01$ SIGNIFICANCE OF L = SIGNIFICANT
 $\gamma = 2785$ DEGREES OF FREEDOM = 2783
 $\gamma =$ STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +100 DEG/RH



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC. 100 DEG F. TPH-1011

Figure 45

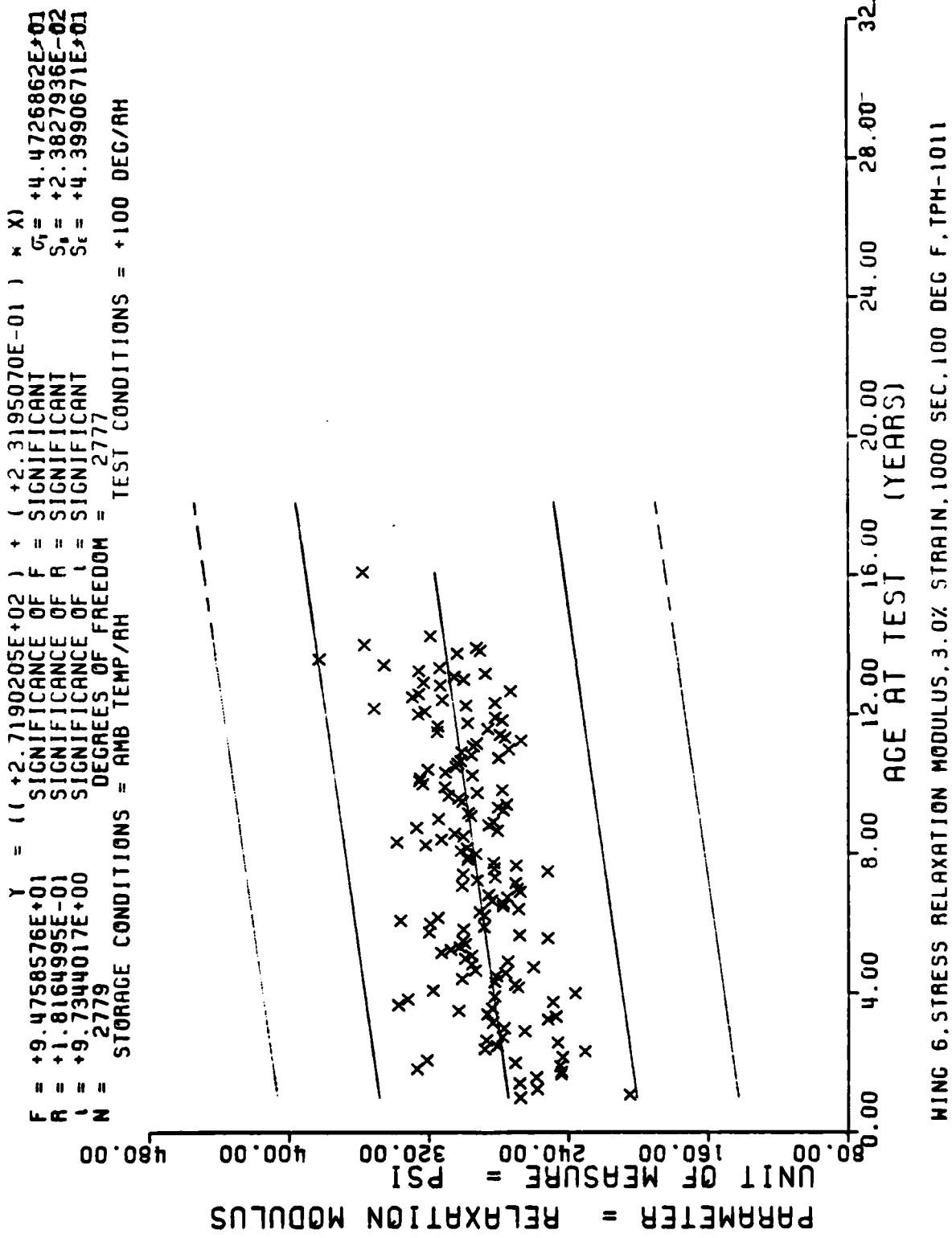


Figure 46

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MNS)	NR SAMP	AGE (MNS)	NR SAMP	AGE (MNS)	NR SAMP	NP SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NR SAMP
8	3	34	57	59	42	84	21	109	9	134	36	36
9	9	35	36	60	65	85	12	110	12	135	12	10
10	6	36	51	61	75	86	18	111	9	136	6	12
11	24	37	21	62	72	87	24	112	36	137	16	18
12	27	38	18	63	60	88	15	113	45	138	42	13
13	27	39	48	64	57	89	21	114	44	139	54	14
14	9	39	48	64	57	89	21	114	44	139	6	15
15	27	40	18	65	33	96	24	115	24	140	6	16
16	15	41	21	66	45	91	27	116	33	141	15	17
17	39	42	15	67	30	92	18	117	21	142	27	18
18	17	43	9	68	48	93	24	118	27	143	31	19
19	6	44	9	69	79	94	24	119	21	144	9	20
20	6	45	3	70	84	95	26	120	30	145	3	21
21	18	46	12	71	69	96	60	121	21	146	6	22
22	6	47	30	72	54	97	54	122	9	147	9	23
23	9	48	39	73	53	98	58	123	12	148	3	24
24	33	49	39	74	44	99	39	124	21	149	6	25
25	30	50	36	75	31	100	21	125	15	150	6	26
26	30	51	66	76	36	101	21	126	24	151	12	27
27	21	52	65	77	36	102	8	127	14	152	3	28
28	27	53	27	78	36	103	21	128	18	154	9	29
29	48	54	30	79	17	174	5	129	2	155	6	30
30	45	55	33	80	23	105	9	130	36	156	6	31
31	33	56	42	81	33	106	3	131	48	157	6	32
32	57	57	51	82	27	177	6	132	9	158	6	33
33	58	57	63	83	18	108	24	133	12	161	3	165
										163	3	166
										171	3	167
										171	3	168
										171	3	171
										193	3	193

WING 6. STRESS RELAXATION MODULUS. 3. % STRAIN. 1000 SFC. 14n DFG F. TPH-1011

This sample size summary is applicable to figures 47 thru 50

$F = +4.2507295E+02$ $Y = (1(+2.8650507E+02) + 1^{+4.1998383E-01}) * X$
 $R = +3.0319316E-01$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +2.0617297E+01$ SIGNIFICANCE OF R = SIGNIFICANT
 $1 = +4201$ SIGNIFICANCE OF 1 = SIGNIFICANT
 $N = 4201$ DEGREES OF FREEDOM = 4199
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +140 DEG/RH

UNIT OF MEASURE = PSI
 PARAMETER = RELAXATION MODULUS

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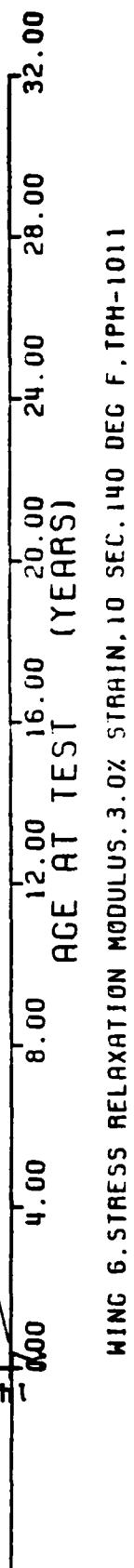
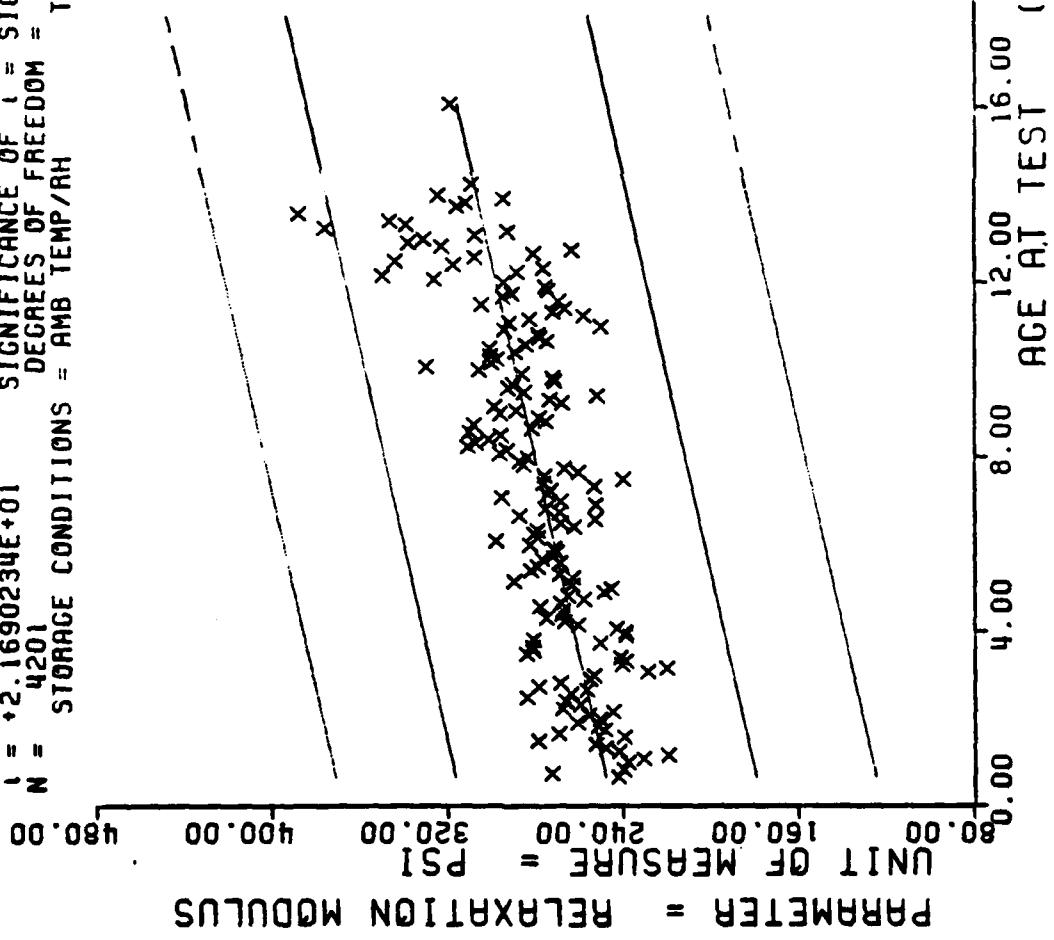


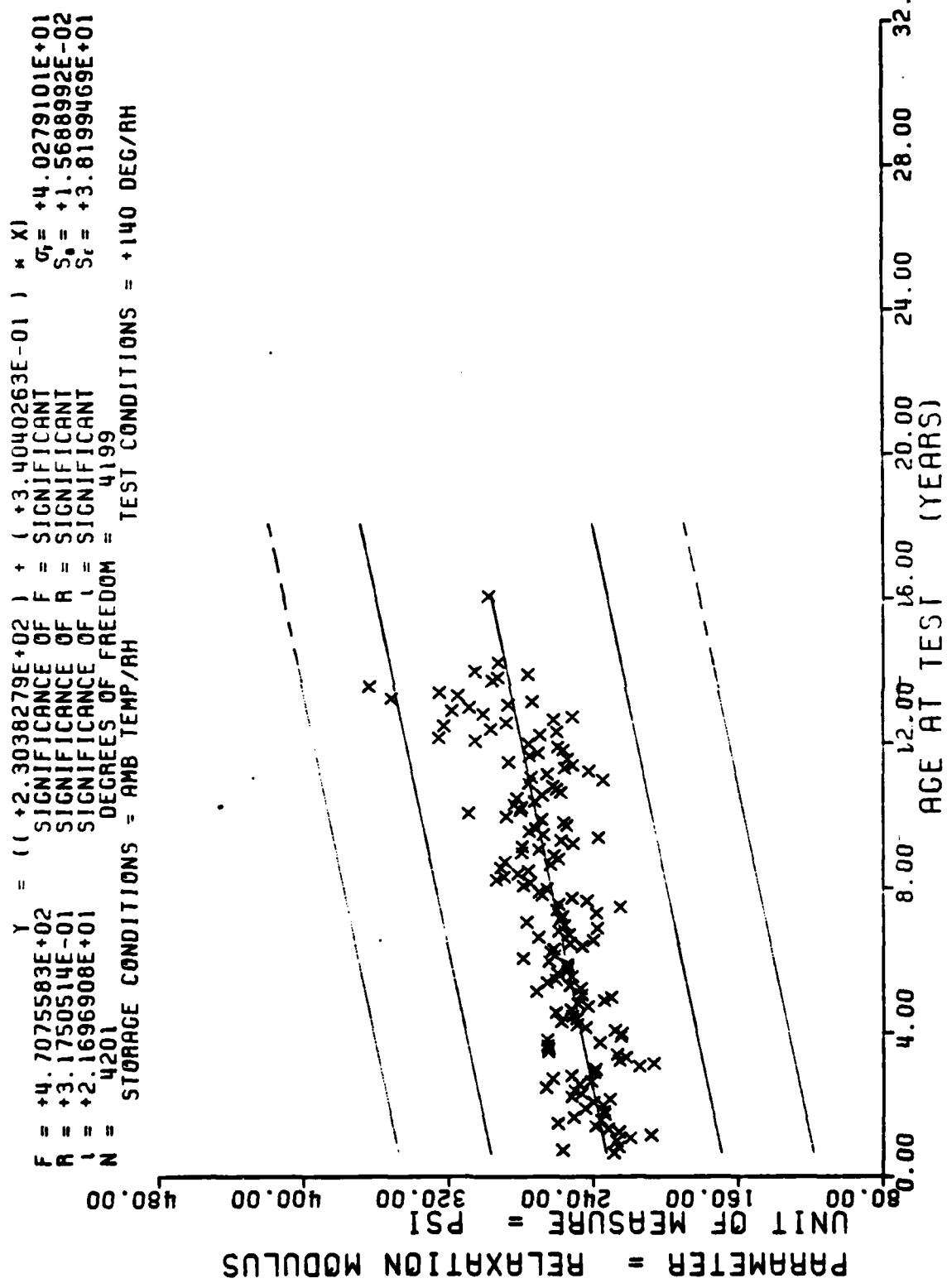
Figure 47

$F = +4.7046626E+02$ SIGNIFICANCE OF $F =$ SIGNIFICANT
 $R = +3.1741732E-01$ SIGNIFICANCE OF $R =$ SIGNIFICANT
 $I = +2.1690234E+01$ SIGNIFICANCE OF $I =$ SIGNIFICANT
 $N = 4201$ DEGREES OF FREEDOM = 4199
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +140 DEG/RH



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC. 140 DEG F. I.PH-1011

Figure 48



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 140 DEG F, TPH-1011

Figure 49

$F = +3.9459657E+02$
 $R = +2.9324911E-01$
 $t = +1.9864455E+01$
 $N = 4196$
 SIGNIFICANCE OF F = SIGNIFICANT
 SIGNIFICANCE OF R = SIGNIFICANT
 SIGNIFICANCE OF t = SIGNIFICANT
 DEGREES OF FREEDOM = 4194
 TEST CONDITIONS = AMB TEMP/RH

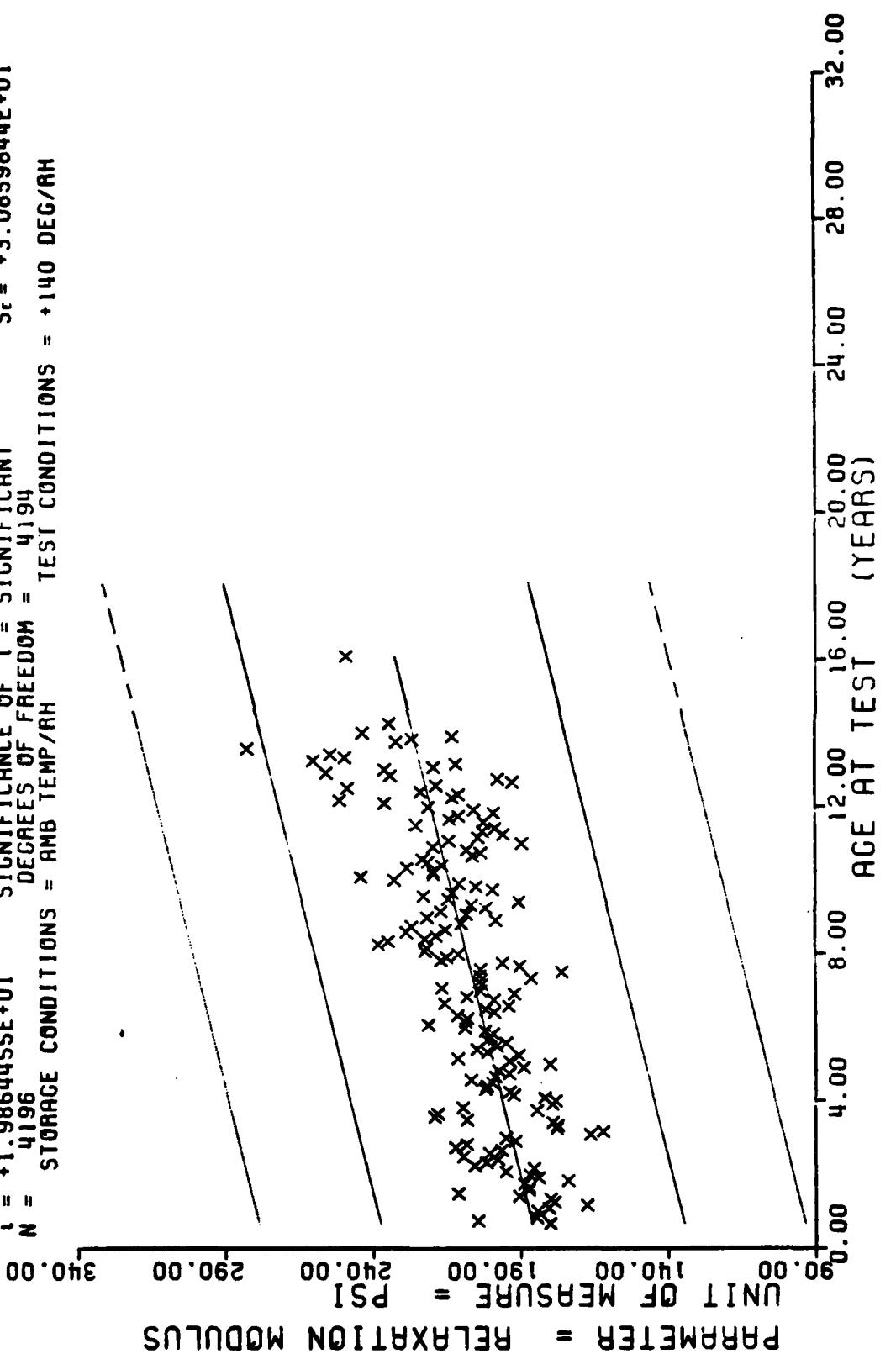


Figure 50

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP							
AGE (MOS)	AGF (MOS)	AGE (MOS)						
8	3	34	51	59	42	84	24	109
9	9	35	33	60	63	85	9	110
10	6	36	57	61	69	86	21	111
12	24	37	21	62	73	87	27	112
13	24	38	18	63	66	88	30	113
14	12	39	48	64	51	89	30	114
15	24	40	18	65	36	90	30	115
16	18	41	21	66	45	91	27	116
17	33	42	18	67	30	92	18	117
18	18	43	9	68	51	93	24	118
19	9	44	6	69	78	94	23	119
20	6	45	6	70	81	95	24	120
21	18	46	6	71	45	96	63	121
22	9	47	30	72	60	97	57	122
23	9	48	42	73	38	98	63	123
24	30	49	42	74	36	99	39	124
25	35	50	36	75	36	100	20	125
26	24	51	57	76	39	101	15	126
27	24	52	68	77	27	102	9	127
28	26	53	27	78	42	103	21	128
29	50	54	33	79	18	104	6	129
30	42	55	33	81	24	105	12	130
31	33	56	42	81	36	106	3	131
32	54	57	54	82	27	107	6	132
33	33	58	57	83	18	108	27	133

FIG. 6. STRESS RELAXATION MODULUS, 30% STRAIN, IN SEC. IN AGF =, IN H-1011

This sample size summary is applicable to figures 51 thru 54

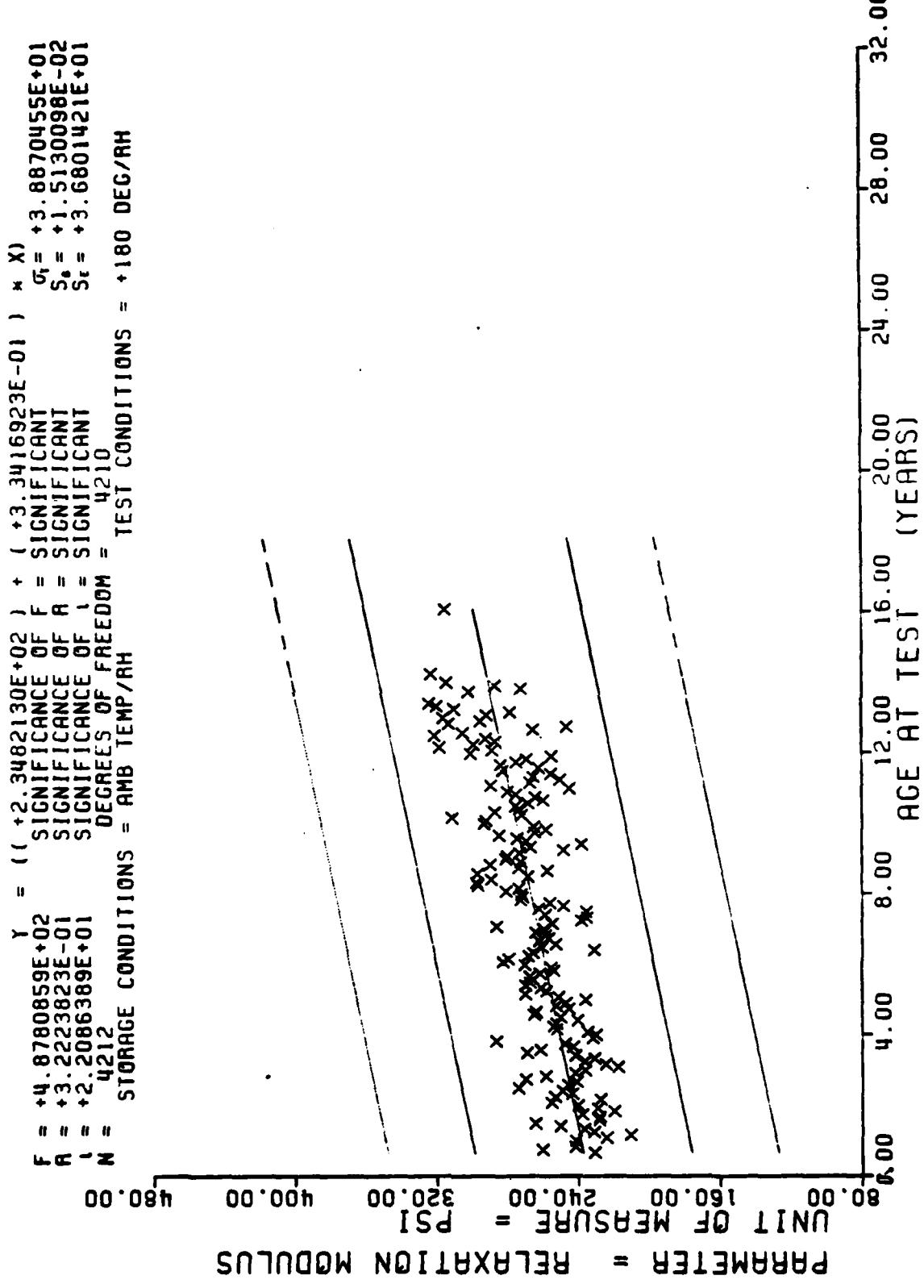


Figure 51

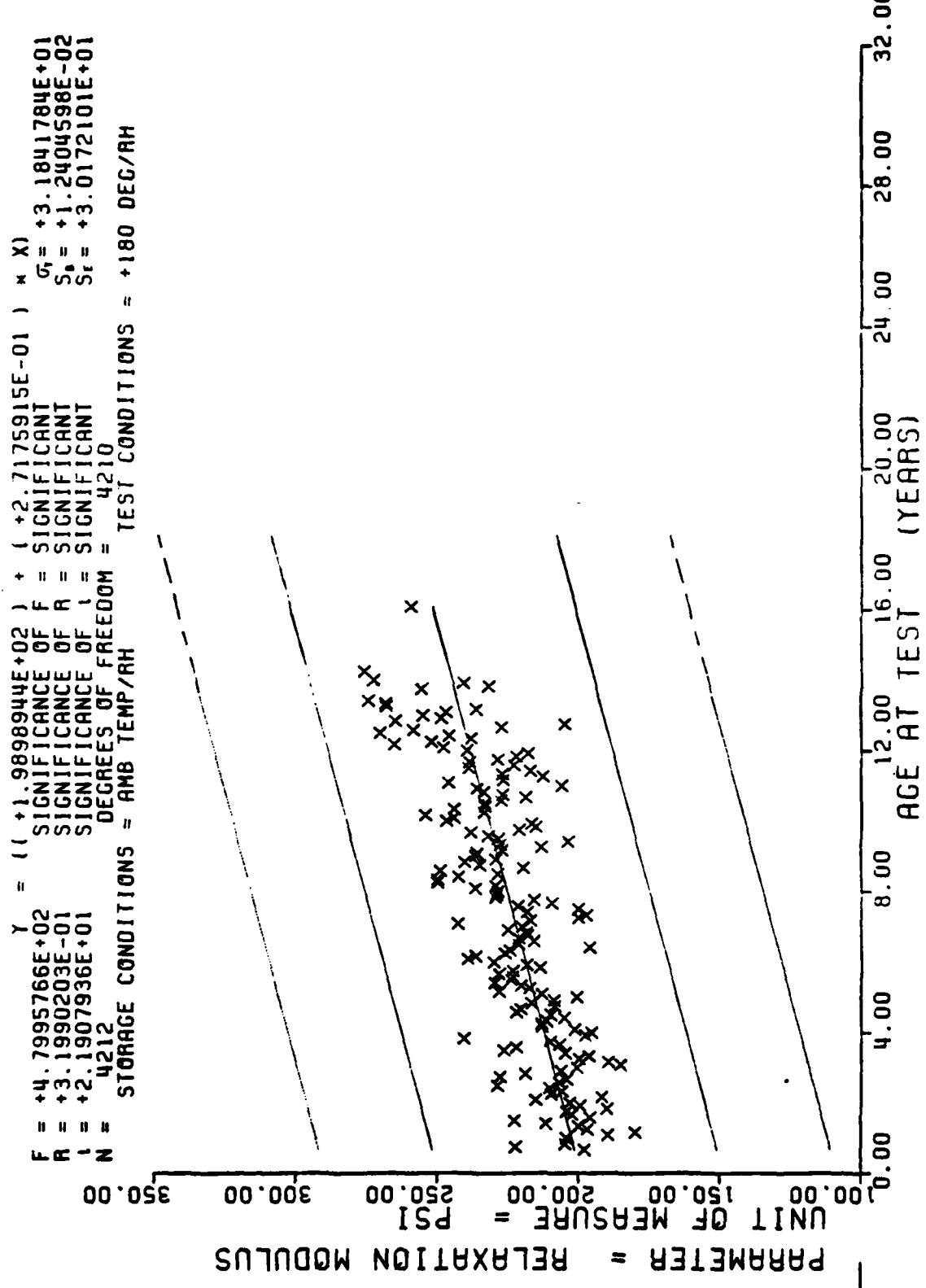


Figure 52

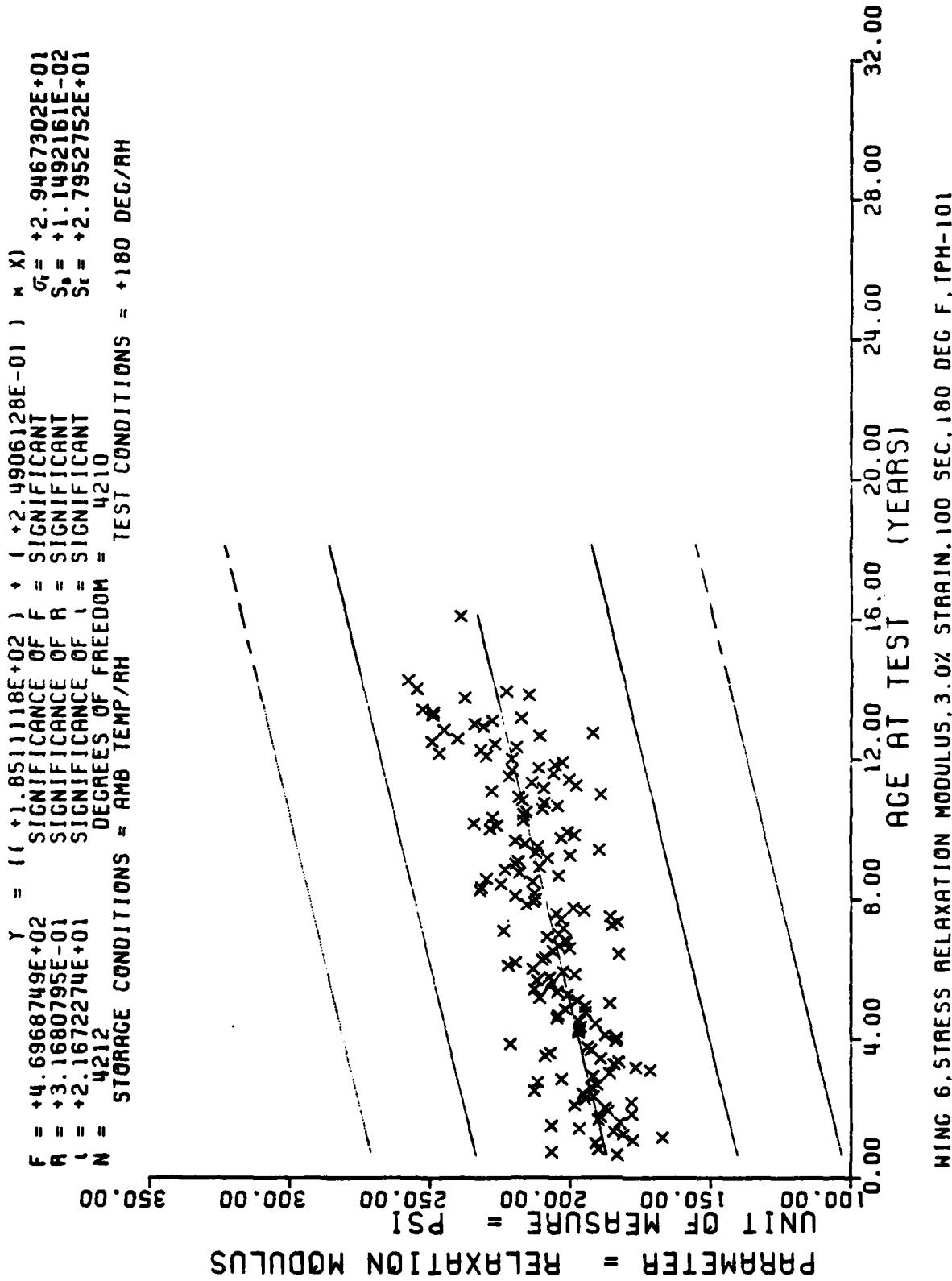
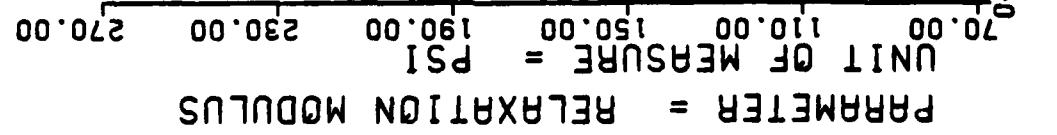


Figure 53

$F = +3.3427839E+02$ $\gamma = ((+1.4289209E+02) + (+1.7132819E-01) * X)$
 $R = +2.7121998E-01$ SIGNIFICANCE OF F = SIGNIFICANT
 $\alpha = +1.8283281E+01$ SIGNIFICANCE OF R = SIGNIFICANT
 $N = 4212$ SIGNIFICANCE OF γ = SIGNIFICANT
DEGREES OF FREEDOM = 4210 TEST CONDITIONS = +180 DEG/RH



WING 6. STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC. 180 DEG F. IPH-1011

Figure 54

*** SAMPLE SIZE SUMMARY ***

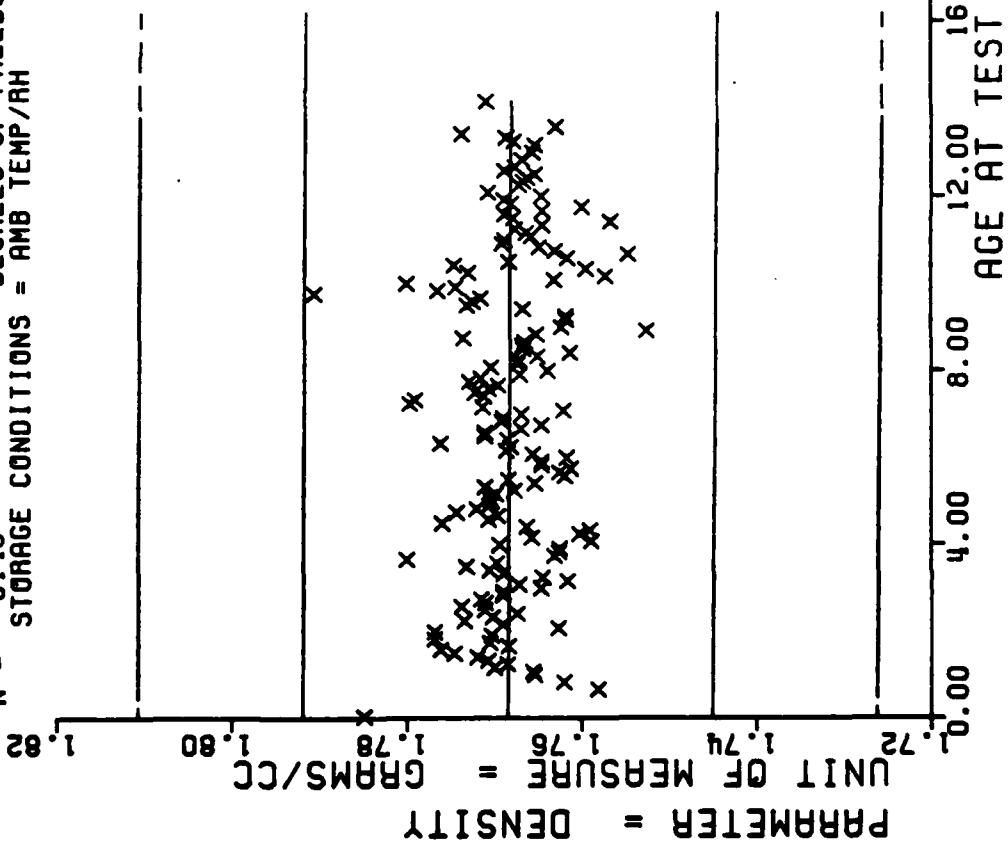
AGE (MOS)	NR SAMP	AGF (MOS)	NO SAMP	NR SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NR SAMP
1	3	34	48	59	44	84	16	119	24	136
6	4	35	64	60	73	85	13	111	60	137
10	24	36	47	61	64	86	16	112	20	138
12	12	37	56	62	74	87	16	113	20	139
13	32	38	47	63	74	88	28	114	76	140
14	36	39	36	64	80	89	44	115	76	141
15	20	40	45	65	90	90	44	116	71	142
16	20	41	36	66	39	91	48	117	32	143
17	28	42	26	67	52	92	32	118	120	144
18	32	43	20	68	64	93	23	119	98	145
19	52	44	4	69	67	94	32	120	104	147
20	12	45	12	70	56	95	39	121	76	148
21	32	46	19	71	84	96	36	122	60	149
22	28	47	36	72	100	97	44	123	8	150
23	24	48	36	73	60	98	36	124	12	151
24	8	49	44	74	107	99	80	126	7	152
25	40	50	24	75	64	100	80	127	28	154
26	56	51	60	76	40	101	56	128	20	155
27	32	52	103	77	44	102	32	129	48	156
28	44	53	112	78	54	103	36	130	24	158
29	43	54	38	79	38	104	12	131	74	159
30	44	55	42	80	50	105	4	132	128	160
31	72	56	70	81	40	106	28	133	79	163
32	64	57	43	82	29	107	16	134	52	170
33	52	58	86	83	40	108	12	135	46	

STAGE 1, WING 6, JP-H1011, SNL GFL, DFNSITY

This sample size summary is applicable to figures 55 thru 57

$\gamma = ((+1.7684740E+00) + (-3.3323555E-06) \times x)$
 $F = +4.8465683E-01$ SIGNIFICANCE OF $F = \text{NOT SIGNIFICANT}$ $\sigma_r = +1.4089208E-02$
 $R = -8.8819797E-03$ SIGNIFICANCE OF $R = \text{NOT SIGNIFICANT}$ $S_o = +4.7866774E-06$
 $t = +6.9617299E-01$ SIGNIFICANCE OF $t = \text{NOT SIGNIFICANT}$ $S_e = +1.4089799E-02$
 $N = 6145$ DEGREES OF FREEDOM = 6143

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



AD-A091 765

OGDEN AIR LOGISTICS CENTER HILL AFB UT PROPELLANT AN--ETC F/G 21/9.2
PROPELLANT SURVEILLANCE REPORT, LGM-30 F & G STAGE I, PHASE G, --ETC(U)

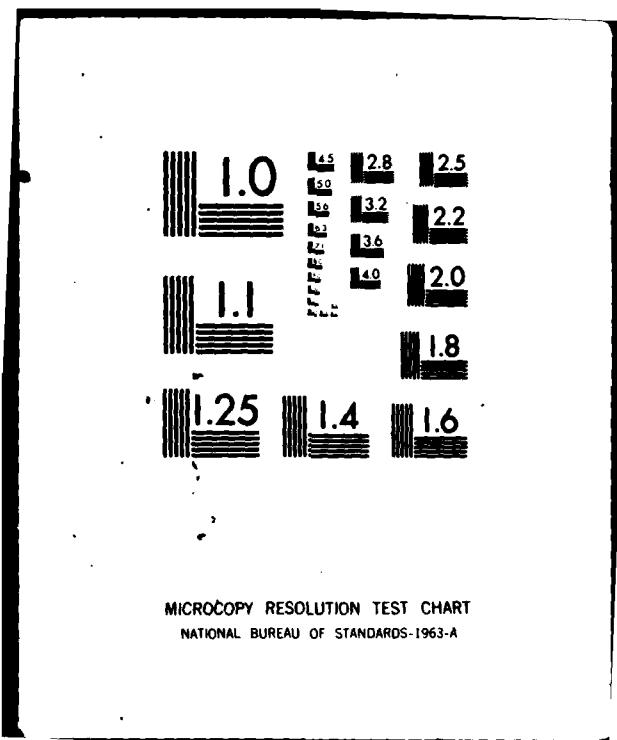
OCT 80 J A THOMPSON

UNCLASSIFIED

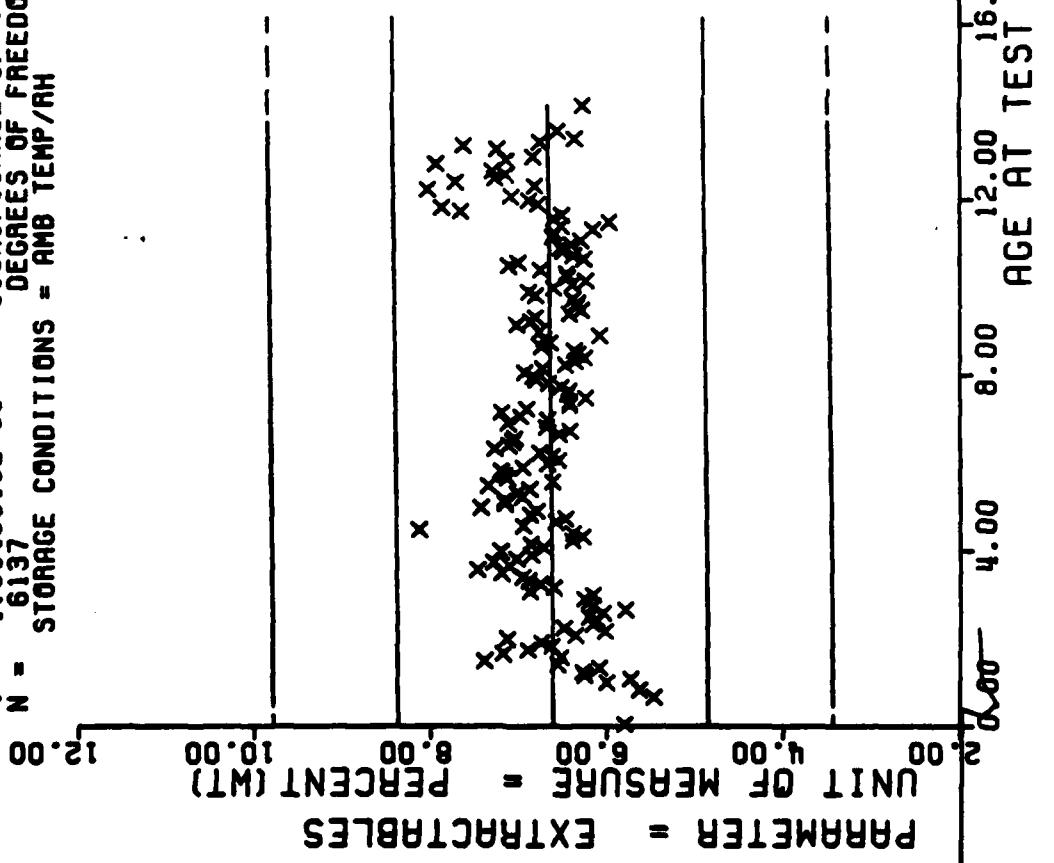
MAKPH-445(80)

NL

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81-1-1
DTIC



$F = +1.1120997E+00$ $\gamma = ((+6.6139134E+00) + (+3.7957260E-04) * X)$
 $R = +1.3462484E-02$ SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma_t = +1.0591499E+00$
 $t = +1.0545613E+00$ SIGNIFICANCE OF t = NOT SIGNIFICANT $S_0 = +3.5993410E-04$
 $N = 6137$ DEGREES OF FREEDOM = 6135 SIGNIFICANCE OF t = NOT SIGNIFICANT $S_1 = +1.0591402E+00$
 STORAGE CONDITIONS = TEST CONDITIONS = AMB TEMP/RH



STAGE 1, WING 6 TP-H1011, SOL GEL, PERCENT EXTRACTABLES

Figure 56

$F = +4.0987041E-01$ $\gamma = ((+4.0203306E+00) + (+4.9911033E-05) \times X)$
 $R = +8.1713787E-03$ $F = \text{NOT SIGNIFICANT}$ $\sigma_r = +2.2942603E-01$
 $N = +6.4021122E-01$ $R = \text{NOT SIGNIFICANT}$ $S_o = +7.7960260E-05$
 $N = 6140$ $S_r = +2.2943706E-01$
 $\text{STORAGE CONDITIONS} = \text{AMB TEMP/RH}$ $\text{DEGREES OF FREEDOM} = 6138$ $\text{TEST CONDITIONS} = \text{AMB TEMP/RH}$

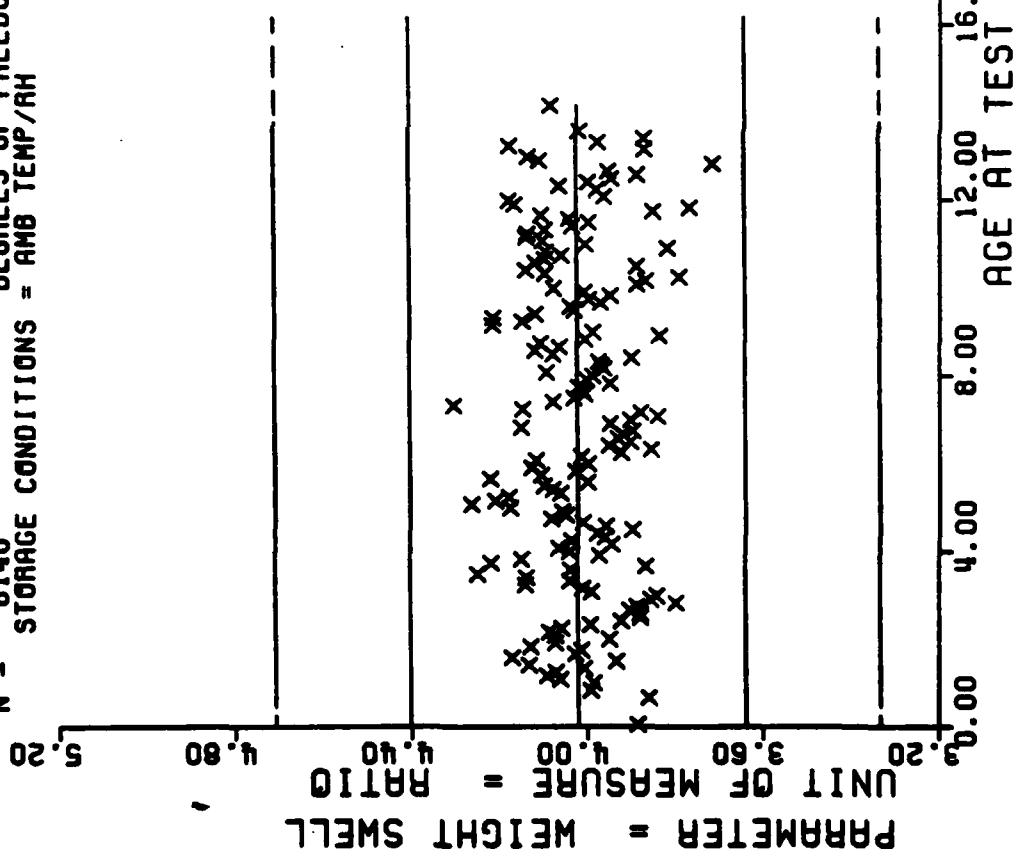


Figure 57

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP								
1	3	34	48	59	44	84	16	110	24
6	4	35	64	67	73	85	13	111	136
10	10	36	47	61	64	86	16	112	137
12	12	37	56	62	74	87	16	113	138
13	32	38	47	63	74	88	28	114	139
14	36	39	36	64	79	89	44	115	140
15	20	40	45	65	90	90	44	116	141
16	20	41	36	66	39	91	48	117	142
17	28	42	26	67	52	92	32	118	143
18	32	43	27	68	64	93	23	119	144
19	52	44	4	69	67	94	32	120	145
20	12	45	12	70	56	95	39	121	146
21	32	46	19	71	84	96	36	122	147
22	28	47	36	72	72	100	97	123	148
23	24	48	36	73	60	98	36	124	149
24	8	49	44	74	107	99	80	125	150
25	40	57	24	75	64	107	80	126	151
26	56	51	60	76	47	101	56	127	152
27	32	52	103	77	44	102	32	128	153
28	44	53	112	78	54	103	36	129	154
29	43	54	14	79	38	104	12	130	155
30	44	55	42	80	50	105	4	131	156
31	72	56	70	81	40	106	28	132	157
32	64	57	43	82	20	107	16	133	158
33	52	58	86	83	39	108	12	134	159
								135	160

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STAGE 1, WING 6, TP-H1011, SNL GEL, CROSSLINK DENSITY

This sample size summary is applicable to figure 58

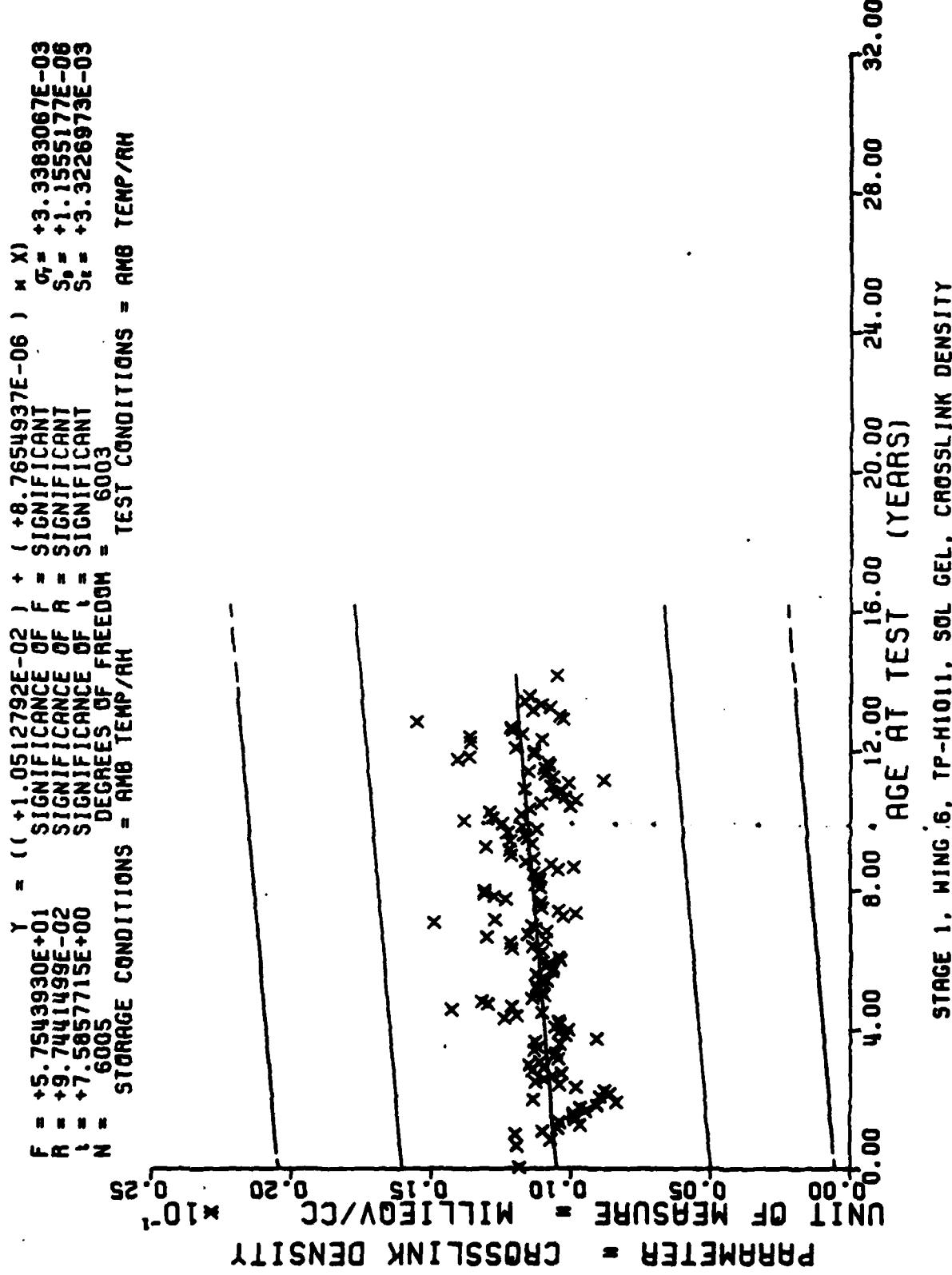


Figure 58

*** SAMPLE SITE SUMMARY ***

AGE (MOS)	NR SAMP	AGF (MNS)	NR SAMP	AGE (MOS)	NR SAMP	AGF (MNS)	NR SAMP	AGE (MOS)	NR SAMP
2	3	27	29	53	72	78	75	103	12
3	15	28	34	54	42	79	21	104	12
4	10	29	59	55	34	80	54	105	3
5	11	30	31	56	74	81	51	106	3
6	23	31	51	57	84	82	32	107	15
7	18	32	67	58	60	83	38	108	6
8	24	33	56	59	40	84	25	109	36
9	24	34	61	60	53	85	33	110	33
10	40	35	39	61	72	86	27	111	18
11	24	36	32	62	99	87	39	112	22
12	40	37	43	63	94	88	32	113	18
13	51	38	29	64	92	89	55	114	47
14	52	35	48	65	37	90	57	115	57
15	52	40	36	66	37	91	39	116	45
16	63	41	12	67	62	92	32	117	107
17	15	42	24	68	62	93	19	118	37
18	65	43	24	69	65	94	37	119	63
19	28	44	16	70	83	95	42	120	81
20	28	46	31	71	49	96	51	121	48
21	17	47	30	72	27	97	95	122	12
22	22	48	37	73	78	98	71	123	3
23	11	49	64	74	60	99	44	124	3
24	19	50	17	75	63	100	39	125	9
25	64	51	60	76	55	101	24	126	3
26	22	52	90	77	43	102	14	128	12

STAGE 1

TOP-H 1011

CONSTANT STRAIN

156 157 159
161 166 166

This sample size summary is applicable to figure 59

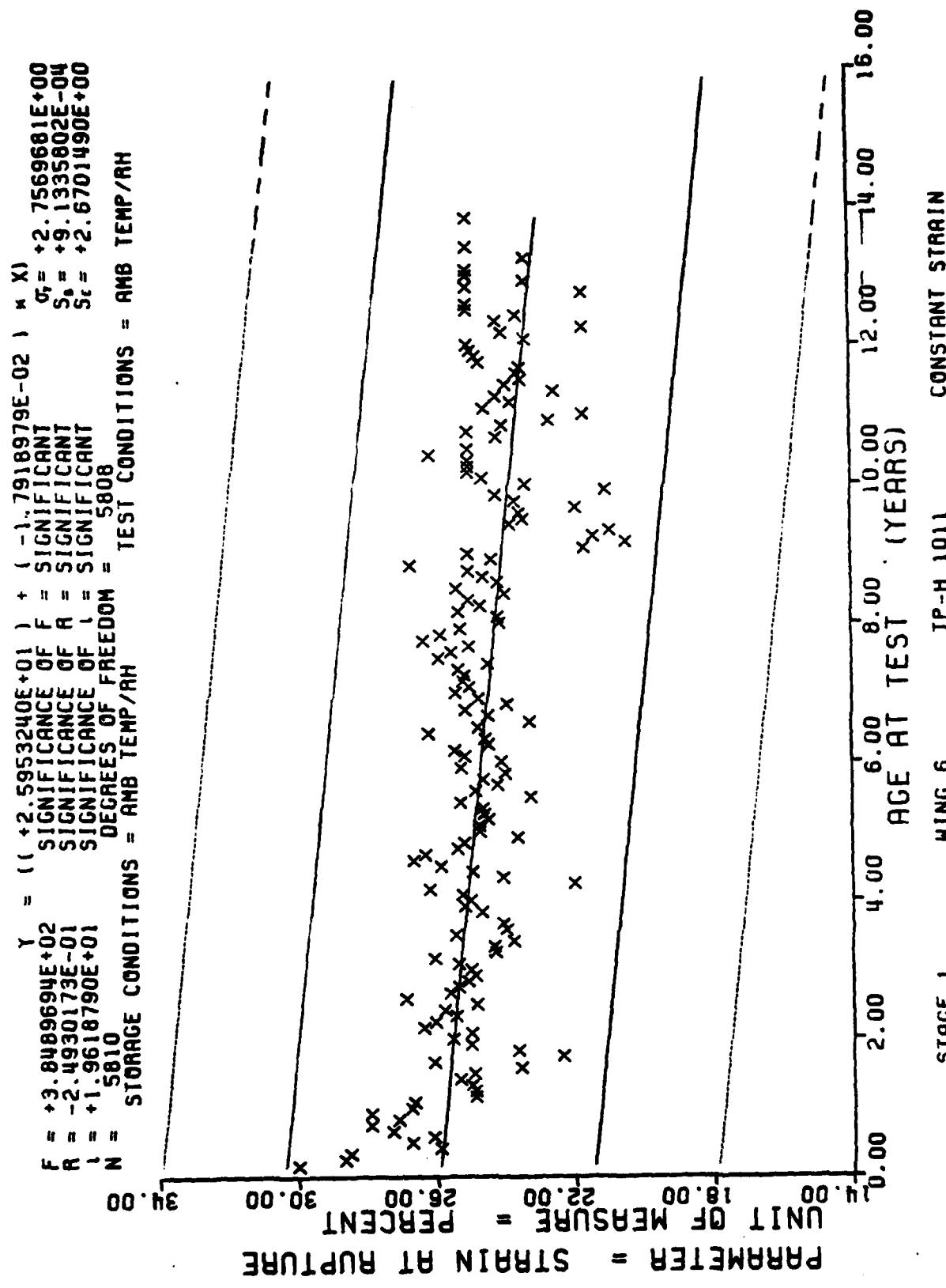


Figure 59

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP								
1	3	32	30	58	54	83	82	109	109
6	3	33	24	59	33	84	12	110	21
7	3	34	27	60	51	85	27	111	15
8	3	35	27	61	57	86	9	112	21
9	12	36	45	62	57	87	24	113	51
10	6	37	18	63	81	88	36	114	21
12	18	38	21	64	42	89	36	115	9
13	15	39	45	65	9	90	51	116	39
14	6	40	15	66	36	91	24	117	36
15	37	41	21	67	42	92	33	118	9
16	18	42	6	68	67	93	18	119	12
17	15	43	6	69	86	94	27	120	30
18	15	44	9	70	105	95	27	121	6
19	6	46	12	71	36	96	15	122	6
20	2	47	9	72	39	97	72	123	21
21	15	48	51	73	42	98	60	124	18
22	3	49	45	74	31	99	51	125	27
24	27	50	51	75	33	100	51	126	21
25	21	51	57	76	30	101	9	127	33
26	39	52	72	77	27	102	15	128	36
27	12	53	27	78	27	103	12	129	27
28	21	54	24	79	21	104	18	130	42
29	24	55	39	80	15	106	3	131	41
31	21	56	60	81	41	107	18	132	21
39	39	57	69	82	18	108	3	133	24

STAGE 1 WING 6 TP-H 1011 SHINE A. 10 SECOND

HARDNESS

171

This sample size summary is applicable to figure 60

$y = (1 + 6.4353342E+01) + (1 + 5.798928E-02) * x$
 $F = 4.0072962E+02$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +2.9922219E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $R^2 = +2.0018232E+01$ SIGNIFICANCE OF R^2 = SIGNIFICANT
 $N = 4077$ DEGREES OF FREEDOM = 4075
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH

PARAMETER = 10 SECOND HARDNESS
 UNIT OF MEASURE = SHORE A

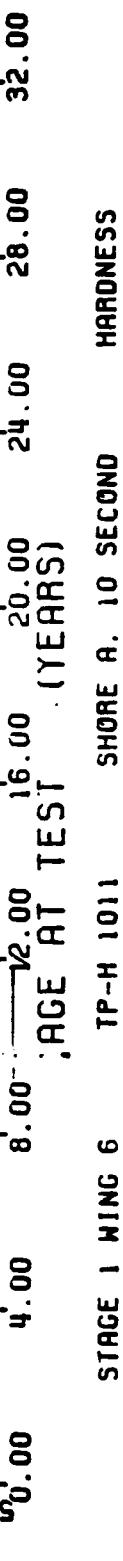


Figure 60

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGF (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
8	3	34	39	59	57	84	6
17	15	35	60	60	43	85	3
11	1	36	39	61	34	86	3
12	6	37	13	62	79	87	3
13	15	38	11	63	46	88	12
14	13	39	16	64	80	89	24
15	16	40	11	65	72	90	36
16	17	41	13	66	38	91	24
17	18	42	30	67	59	92	9
18	19	43	4	68	38	93	17
19	22	44	10	69	40	94	15
20	35	45	7	70	46	95	16
21	16	46	12	71	11	96	18
22	19	47	16	72	12	97	38
23	21	48	4	73	8	98	40
24	19	49	36	74	4	99	26
25	25	50	13	75	36	100	23
26	27	51	30	76	26	101	21
27	36	52	39	77	22	102	8
28	38	52	47	78	13	103	6
29	43	54	37	79	7	105	9
30	24	55	25	80	21	106	6
31	51	56	21	81	24	108	3
32	42	57	25	82	7	113	3
33	54	58	22	83	9	114	11

STAGE I WING 6 TP-H 1011 TIME TO MAXIMUM PRESSURE OFF SURFACE TIME

This sample size summary is applicable to figures 61 and 62

$y = (+3.5805614E+00 + (-9.4303953E-02) x)$
 $F = +2.5480146E+00$ SIGNIFICANCE OF F = NOT SIGNIFICANT
 $R = -3.0255309E-02$ SIGNIFICANCE OF R = NOT SIGNIFICANT
 $t = +1.5962501E+00$ SIGNIFICANCE OF t = NOT SIGNIFICANT
 $N = 2783$ DEGREES OF FREEDOM = 2781
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 500 PSI INT PRES

UNIT OF MEASURE = PSI
 PARAMETER = MAXIMUM PRESSURE
 $\times 10^3$

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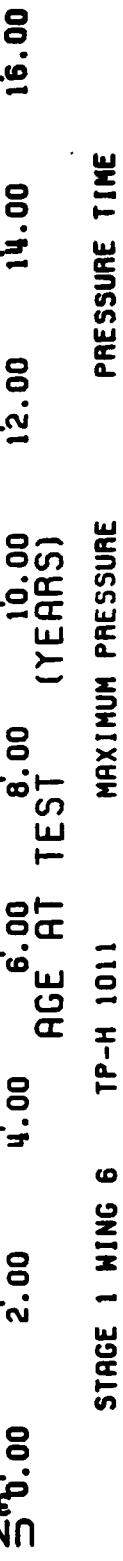


Figure 61

$Y = ((+6.9429935E-01) + (-1.4509495E-04) \times X)$
 $F = +9.5138183E+00$ SIGNIFICANCE OF $F = \text{SIGNIFICANT}$ $G = +7.9702330E-02$
 $R = -5.8389578E-02$ SIGNIFICANCE OF $R = \text{SIGNIFICANT}$ $S = +1.7040819E-05$
 $I = +3.0844478E+00$ SIGNIFICANCE OF $I = \text{SIGNIFICANT}$ $S_I = +7.9580652E-02$
 $N = 2783$ DEGREES OF FREEDOM = 2781
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 500 PSI INT PRES

PARAMETER = TIME TO MAX PRESS
 UNIT OF MEASURE = SECONDS
 0.20 0.40 0.60 0.80 1.00
 1.20

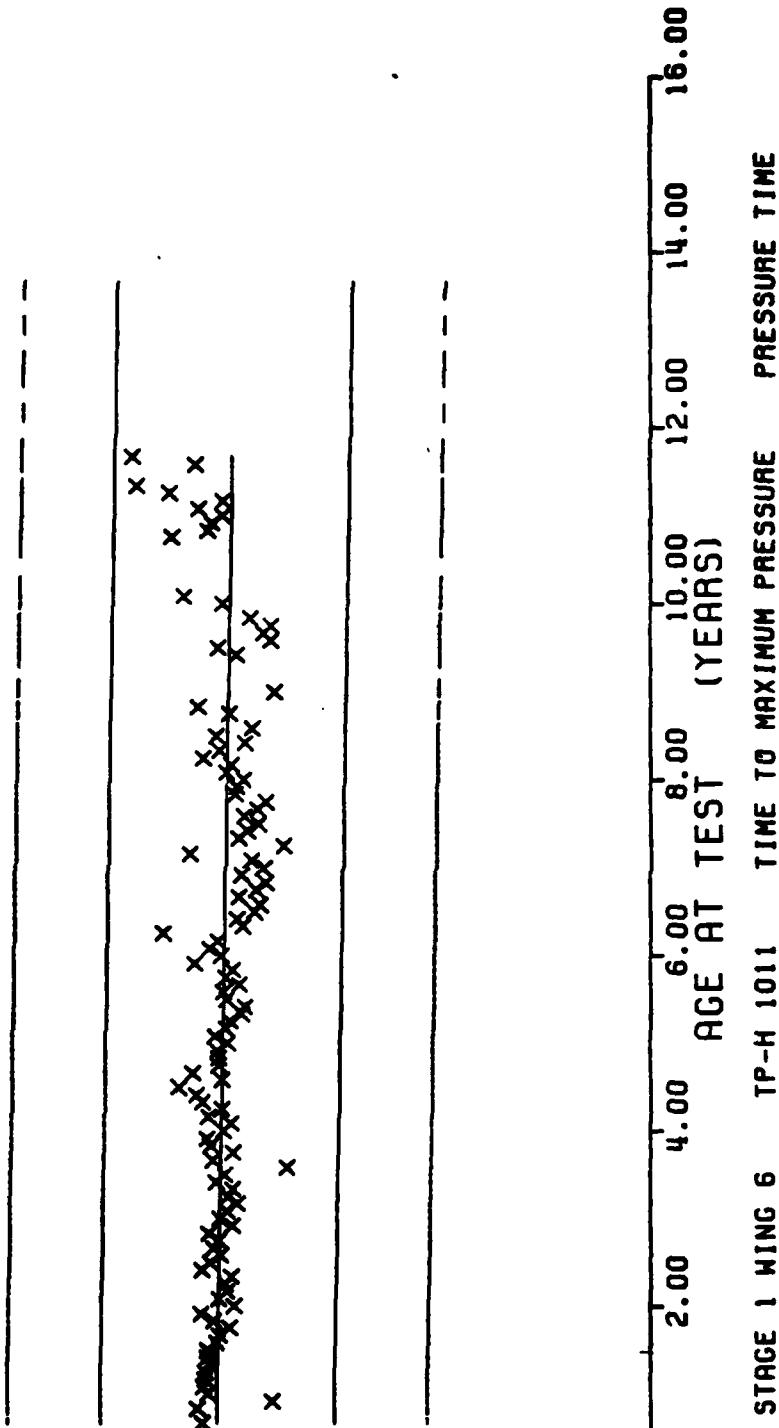


Figure 62

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NR SAMP
8	3	34	48	59	33	84	17	109	8	134	33
9	17	35	39	60	42	85	19	110	22	135	12
10	7	36	30	61	44	86	11	111	7	136	13
12	22	37	53	62	33	87	12	112	7	137	11
13	29	38	18	63	34	88	9	113	18	138	62
14	15	39	32	64	33	89	22	114	22	139	45
15	21	47	27	65	50	90	17	115	22	140	12
16	24	41	21	66	32	91	17	116	17	141	6
17	9	42	15	67	31	92	7	117	110	142	24
18	33	43	12	68	49	93	27	118	65	143	47
19	4	44	19	69	97	94	27	119	15	144	2
20	8	45	9	70	61	95	35	120	17	145	6
21	25	46	3	71	29	96	22	121	11	147	4
22	24	47	56	72	19	97	34	122	28	148	2
23	12	48	32	73	26	98	72	123	6	149	8
24	18	49	42	74	5	99	38	124	23	150	8
25	42	50	25	75	26	100	23	125	31	151	2
26	15	51	64	76	25	104	8	126	9	152	2
27	27	52	66	77	21	102	14	127	29	154	2
28	24	53	80	78	37	103	11	128	26	155	4
29	39	54	15	79	16	104	9	129	11	156	2
30	42	55	39	80	32	105	9	130	41	157	1
31	48	56	51	81	55	106	11	131	54	158	1
32	54	57	45	82	16	107	8	132	27	159	2
33	39	58	66	83	22	108	8	133	14	161	2
										166	2
										167	2
										173	2

STAGE 1. WING 6, TR-MINII. THERMAL COEFFICIENT OF LINEAR EXPANSION ABOVE 1073
This sample size summary is applicable to figures 63 and 64

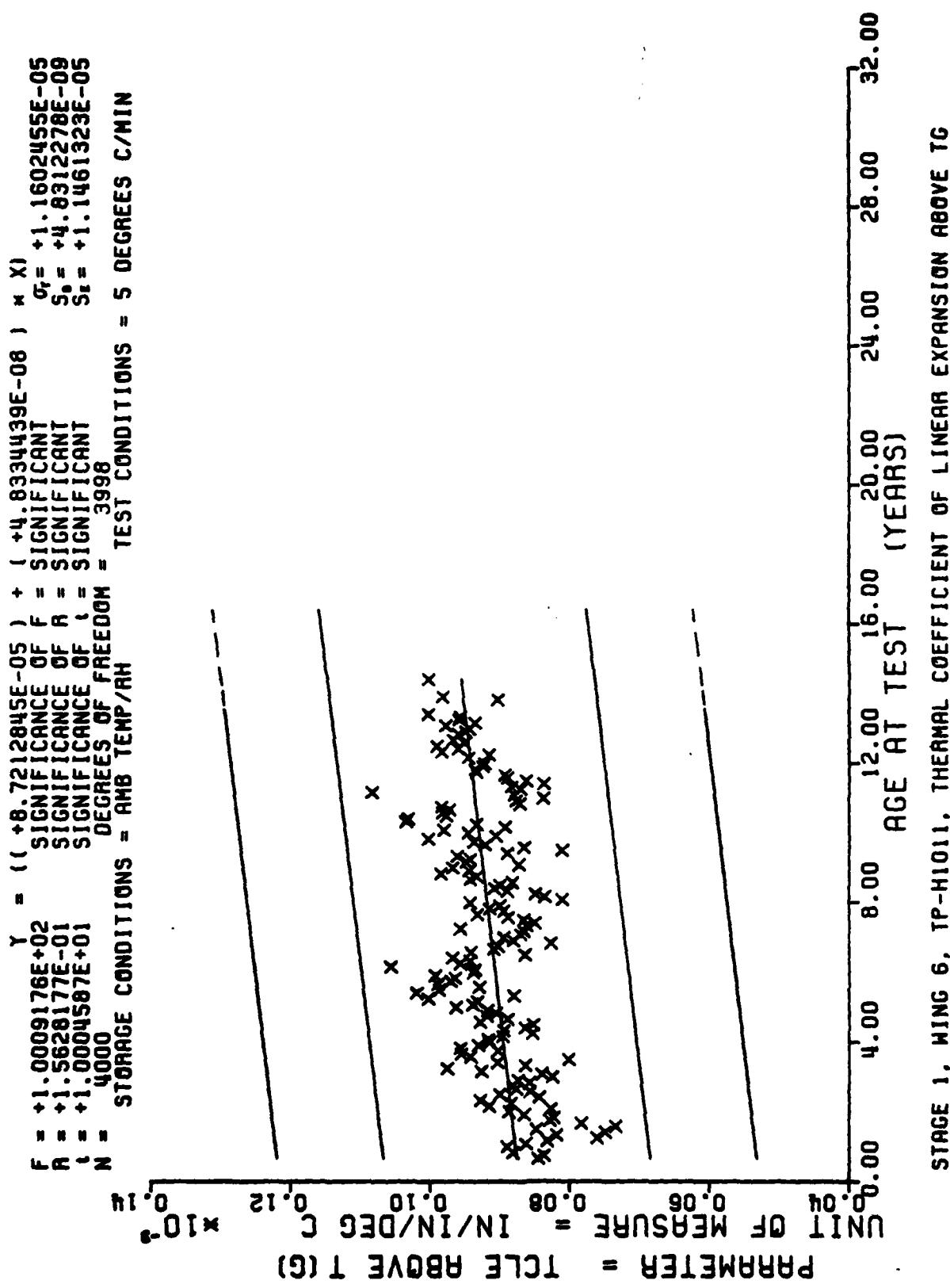
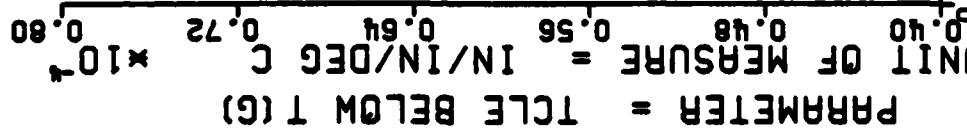


Figure 63

$F = +1.1377751E+02$
 $F = +5.6604095E-05$
 $F = \text{SIGNIFICANCE OF } F$
 $F = \text{SIGNIFICANT}$
 $F = +1.6634640E-01$
 $F = +1.0666654E+01$
 $F = \text{SIGNIFICANCE OF } F$
 $F = \text{SIGNIFICANT}$
 $F = 4000$
 $F = \text{DEGREES OF FREEDOM} = 3998$
 $F = \text{STORAGE CONDITIONS} = \text{AMB TEMP/RH}$
 $F = +2.5143969E-08$
 $F = \text{TEST CONDITIONS} = 5 \text{ DEGREES C/MIN}$
 $\sigma_F = +5.6705078E-06$
 $S_F = +2.3572498E-09$
 $S_F = +5.5922020E-08$



STAGE 1. WING 6. TP-H1011 THERMAL COEFFICIENT OF LINEAR EXPANSION BELOW TG

Figure 64

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGF (MNS)	NR SAMP	AGF (MOS)	NR SAMP	AGF (MOS)	NR SAMP	AGF (MOS)	NR SAMP
1	3	37	13	65	14	95	7	125	2
10	1	38	4	66	23	96	4	126	2
11	1	39	7	67	34	97	6	127	2
13	1	40	5	68	20	98	4	130	4
15	1	41	17	69	16	99	5	131	6
16	1	42	5	70	31	100	2	132	8
18	7	43	2	71	16	101	2	133	5
19	2	44	2	72	8	102	5	134	4
20	4	45	3	73	12	103	6	135	4
21	4	46	3	75	2	104	11	136	4
22	20	47	1	76	1	105	4	138	2
23	4	48	4	79	6	106	4	139	2
24	4	49	3	81	8	108	2	140	2
25	6	50	3	82	2	109	2	142	8
26	14	51	3	84	2	110	2	143	2
27	2	52	3	85	4	111	2	145	2
28	4	56	3	86	8	114	2	146	6
29	14	57	9	87	3	115	4	147	6
30	12	58	4	88	6	117	2	149	6
31	10	59	13	89	2	118	4	150	4
32	2	60	10	90	4	120	8	151	6
33	6	61	23	91	3	121	14	153	2
34	10	62	21	92	2	122	16	154	2
35	9	63	32	93	2	123	4	155	6
36	22	64	23	94	4	124	2	156	2

STAGE I WING 6

TGA IGNITION TEMPERATURE, ° NEGRFF C RISE/MINUTE

This sample size summary is applicable to figure 65

$\gamma = ((+3.0917547E+02) + (+6.2661905E-02) \times X) \times 10^{-6}$
 $F = +7.6767925E+01$ SIGNIFICANCE OF $F = \text{SIGNIFICANT}$
 $R = +2.7145910E-01$ SIGNIFICANCE OF $R = \text{SIGNIFICANT}$
 $t = +8.7617307E+00$ SIGNIFICANCE OF $t = \text{SIGNIFICANT}$
 $N = 967$ DEGREES OF FREEDOM = 965
 STORAGE CONDITIONS = AMB TEMP/RH

TEST CONDITIONS = AMB TEMP/RH

PARAMETER = IGNITION TEMP

UNIT OF MEASURE = DEGREES C

STAGE I WING 6

TGA IGNITION TEMPERATURE. 9 DEGREE C RISE/MINUTE

20.00 4.00 8.00 12.00 16.00 20.00 24.00 28.00 32.00
 AGE AT TEST (YEARS)

Figure 65

*** SAMPLE SIZE SUMMARY ***						
AGF (MOSI)	NR SAMP	AGF (MOSI)	NR SAMP	AGF (MOSI)	NR SAMP	AGF (MOSI)
1	3	37	3	65	8	95
10	1	38	4	66	12	96
11	1	39	5	67	17	97
13	1	40	3	68	10	98
15	1	41	15	69	8	99
16	1	42	3	70	16	100
18	1	43	2	71	6	101
19	1	44	2	72	5	102
20	1	45	1	73	6	103
21	2	46	3	75	1	104
22	10	47	1	76	1	105
23	2	48	4	79	2	106
24	2	49	3	81	4	108
25	3	50	1	82	1	109
26	7	51	3	84	1	110
27	1	53	1	85	2	111
28	2	56	2	86	4	114
29	8	57	4	87	2	115
30	6	58	3	88	3	117
31	5	59	11	89	1	118
32	1	60	12	90	2	120
33	3	61	12	91	2	121
34	4	62	11	92	1	122
35	5	63	17	93	1	123
36	7	64	11	94	2	124
						1
						156
						1
						157
						1
						158
						1
						161
						1
						166
						1
						172
						1
						192
						1

SAGE 1 WING 6 TGA % WT LOSS AT 250 °F G C HOLD, 12 °F G RISE/MIN TO HOLD

This sample size summary is applicable to figure 66

$\gamma = ((+2.1109818E+01) + (+2.3520544E-02) * X)$
 $F = +2.5304005E+01$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = +2.1782474E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $\lambda = +5.0303087E+00$ SIGNIFICANCE OF λ = SIGNIFICANT
 $N = 510$ DEGREES OF FREEDOM = 508
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG R/H HOLD

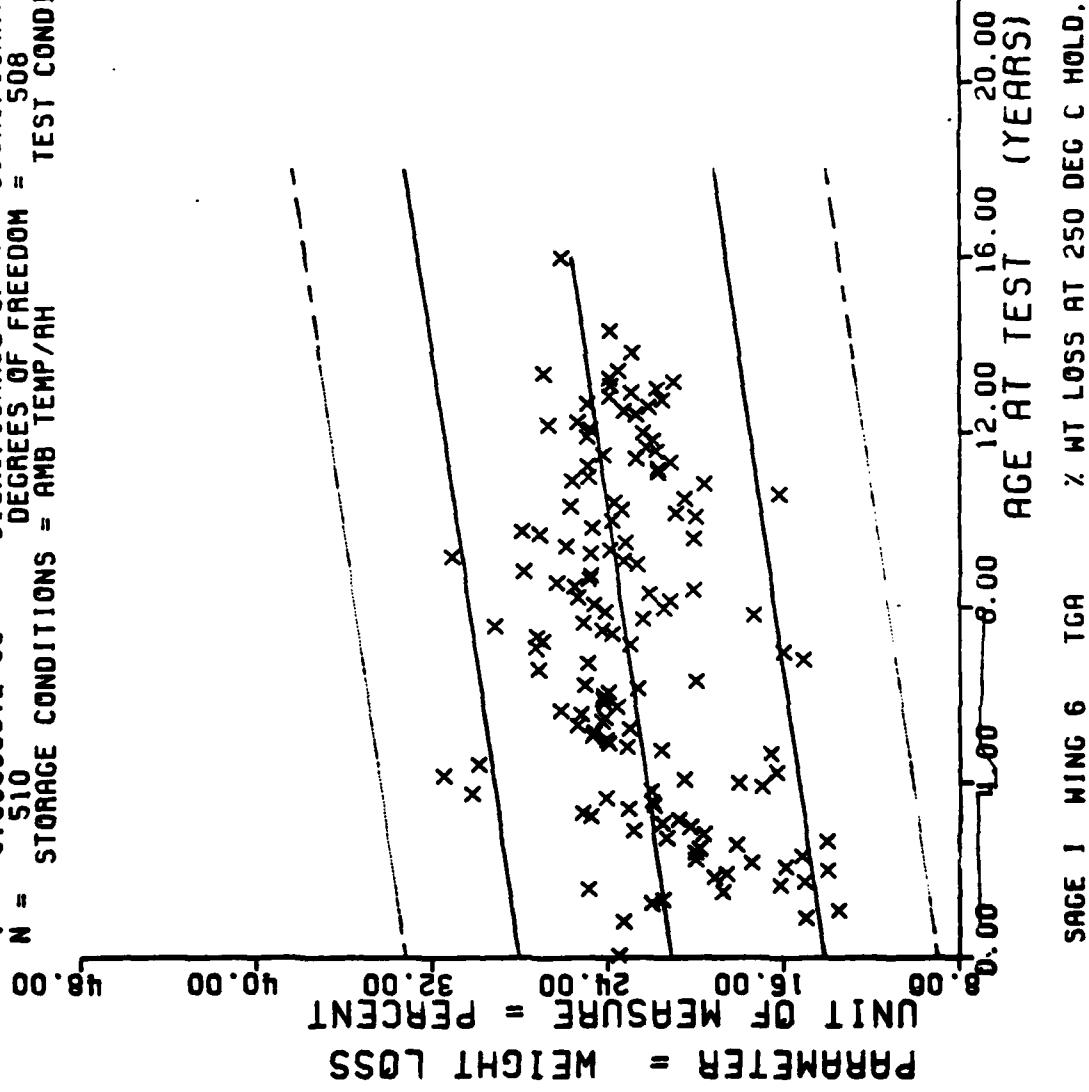


Figure 66

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGF (MOS)	NR SAMP																
1	3	37	13	65	14	95	7	125	2	157	2	126	2	158	2	161	4	162	2
10	1	36	4	66	23	96	4	127	2	161	2	127	4	161	2	162	1	166	2
11	1	35	5	67	34	97	5	130	4	130	4	130	4	130	4	130	6	130	2
12	1	40	4	68	20	98	4	131	4	131	4	131	4	131	4	131	6	131	2
13	1	41	17	69	16	99	4	132	2	132	2	132	2	132	2	132	3	132	2
14	1	42	5	70	31	100	2	133	2	133	2	133	2	133	2	133	5	133	2
15	1	42	5	70	31	101	2	134	5	134	5	134	5	134	5	134	6	134	2
16	1	43	2	71	10	101	2	135	4	135	4	135	4	135	4	135	4	135	2
17	1	43	2	71	10	102	5	136	4	136	4	136	4	136	4	136	4	136	2
18	1	44	2	72	8	102	5	137	4	137	4	137	4	137	4	137	4	137	2
19	1	44	2	72	8	103	4	138	4	138	4	138	4	138	4	138	4	138	2
20	1	45	2	73	12	103	7	139	4	139	4	139	4	139	4	139	4	139	2
21	1	46	3	75	2	104	9	140	4	140	4	140	4	140	4	140	4	140	2
22	1	47	1	76	1	105	4	141	4	141	4	141	4	141	4	141	4	141	2
23	1	48	4	79	6	106	4	142	2	142	2	142	2	142	2	142	2	142	2
24	1	49	3	81	6	106	2	143	2	143	2	143	2	143	2	143	2	143	2
25	1	50	2	82	2	107	2	144	2	144	2	144	2	144	2	144	2	144	2
26	1	51	3	84	2	108	2	145	2	145	2	145	2	145	2	145	2	145	2
27	1	52	3	85	4	111	2	146	2	146	2	146	2	146	2	146	2	146	2
28	1	53	3	86	8	114	2	147	4	147	4	147	4	147	4	147	4	147	2
29	1	54	2	87	3	115	4	148	2	148	2	148	2	148	2	148	2	148	2
30	1	55	4	88	6	117	2	149	4	149	4	149	4	149	4	149	4	149	2
31	1	56	3	89	2	118	4	150	4	150	4	150	4	150	4	150	4	150	2
32	1	57	9	87	3	115	4	151	6	151	6	151	6	151	6	151	6	151	2
33	1	58	4	88	6	117	2	152	2	152	2	152	2	152	2	152	2	152	2
34	1	59	13	89	2	118	4	153	2	153	2	153	2	153	2	153	2	153	2
35	1	60	18	90	4	120	8	154	2	154	2	154	2	154	2	154	6	154	2
36	1	61	23	91	3	121	14	155	4	155	4	155	4	155	4	155	6	155	2
37	1	62	21	92	2	122	16	156	2	156	2	156	2	156	2	156	2	156	2
38	1	63	32	93	2	123	4	157	2	157	2	157	2	157	2	157	2	157	2
39	1	64	23	94	4	124	2	158	2	158	2	158	2	158	2	158	2	158	2
40	1	65	14	95	7	125	2	159	2	159	2	159	2	159	2	159	2	159	2
41	1	66	23	96	4	126	2	160	2	160	2	160	2	160	2	160	2	160	2
42	1	67	34	97	5	127	2	161	2	161	2	161	2	161	2	161	2	161	2
43	1	68	20	98	4	128	2	162	2	162	2	162	2	162	2	162	2	162	2
44	1	69	16	99	4	129	2	163	2	163	2	163	2	163	2	163	2	163	2
45	1	70	31	100	2	130	2	164	2	164	2	164	2	164	2	164	2	164	2
46	1	71	10	101	2	131	2	165	2	165	2	165	2	165	2	165	2	165	2
47	1	72	8	102	5	132	2	166	2	166	2	166	2	166	2	166	2	166	2
48	1	73	12	103	7	133	4	167	2	167	2	167	2	167	2	167	2	167	2
49	1	74	3	81	6	105	4	168	2	168	2	168	2	168	2	168	2	168	2
50	1	75	2	82	2	106	2	169	2	169	2	169	2	169	2	169	2	169	2
51	1	76	3	84	2	107	2	170	2	170	2	170	2	170	2	170	2	170	2
52	1	77	3	85	4	110	2	171	2	171	2	171	2	171	2	171	2	171	2
53	1	78	3	86	8	111	2	172	2	172	2	172	2	172	2	172	2	172	2
54	1	79	13	87	3	115	4	173	4	173	4	173	4	173	4	173	4	173	2
55	1	80	18	88	6	117	2	174	2	174	2	174	2	174	2	174	2	174	2
56	1	81	4	89	2	118	4	175	4	175	4	175	4	175	4	175	4	175	2
57	1	82	9	87	3	115	4	176	4	176	4	176	4	176	4	176	4	176	2
58	1	83	4	88	6	117	2	177	2	177	2	177	2	177	2	177	2	177	2
59	1	84	13	89	2	118	4	178	4	178	4	178	4	178	4	178	4	178	2
60	1	85	18	90	4	120	8	179	2	179	2	179	2	179	2	179	2	179	2
61	1	86	23	91	3	121	14	180	2	180	2	180	2	180	2	180	2	180	2
62	1	87	4	88	2	122	16	181	2	181	2	181	2	181	2	181	2	181	2
63	1	88	13	89	2	123	4	182	2	182	2	182	2	182	2	182	2	182	2
64	1	89	23	94	4	124	2	183	2	183	2	183	2	183	2	183	2	183	2
65	1	90	14	95	7	125	2	184	2	184	2	184	2	184	2	184	2	184	2
66	1	91	23	96	4	126	2	185	2	185	2	185	2	185	2	185	2	185	2
67	1	92	21	97	2	127	16	186	2	186	2	186	2	186	2	186	2	186	2
68	1	93	32	98	2	128	4	187	2	187	2	187	2	187	2	187	2	187	2
69	1	94	23	99	4	129	2	188	2	188	2	188	2	188	2	188	2	188	2
70	1	95	14	100	2	130	2	189	2	189	2	189	2	189	2	189	2	189	2
71	1	96	23	101	7	125	2	190	2	190	2	190	2	190	2	190	2	190	2
72	1	97	4	102	5	127	2	191	2	191	2	191	2	191	2	191	2	191	2
73	1	98	21	103	2	128	16	192	2	192	2	192	2	192	2	192	2	192	2
74	1	99	32	104	2	129	4	193	2	193	2	193	2	193	2	193	2	193	2
75	1	100	23	105	4	130	2	194	2	194	2	194	2	194	2	194	2	194	2
76	1	101	14	106	7	125	2	195	2	195	2	195	2	195	2	195	2	195	2
77	1	102	23	107	5	127	2	196	2	196	2	196	2	196	2	196	2	196	2
78	1	103	4	108	2	128	16	197	2	197	2	197	2	197	2	197	2	197	2
79	1	104	23	109	4	129	2	198	2	198	2	198	2	198	2	198	2	198	2
80	1	105	14	110	7	125	2	199	2	199	2	199	2	199	2</				

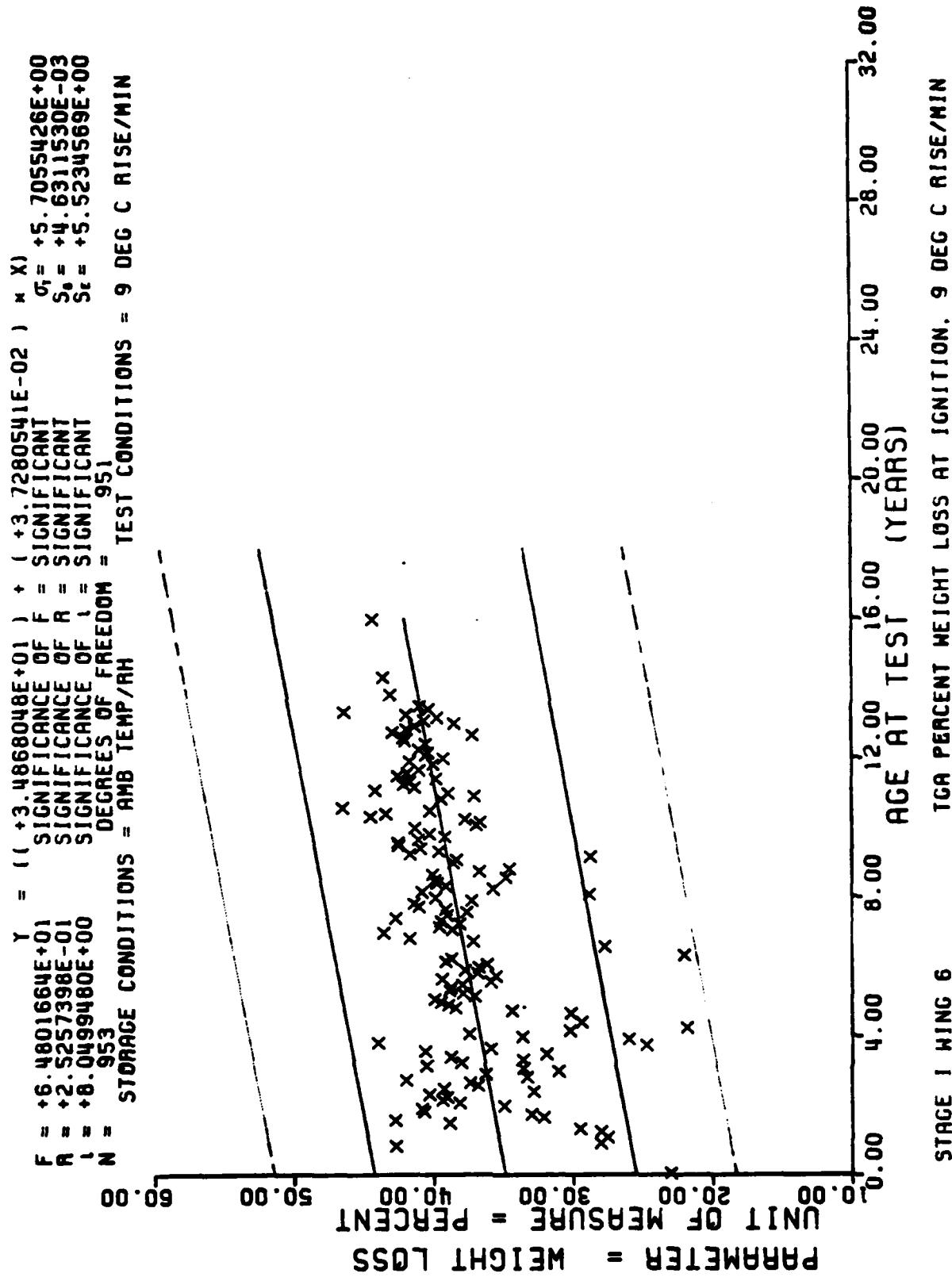


Figure 67

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP										
5	9	30	29	55	15	80	34	105	6	130	62
6	27	31	28	56	32	81	35	106	15	131	39
7	11	32	23	57	27	82	30	107	4	132	24
8	14	33	19	58	41	83	29	108	14	133	16
9	12	34	33	59	33	84	18	109	13	134	6
10	3	35	24	60	43	85	20	110	4	135	10
11	3	36	35	61	41	86	16	111	6	136	8
12	24	37	24	62	35	87	19	112	12	137	10
13	15	38	9	63	46	88	21	113	37	138	10
14	18	39	22	64	24	89	32	114	58	139	10
15	8	40	21	65	30	90	32	115	33	140	8
16	29	41	5	66	30	91	13	116	9	141	8
17	14	42	11	67	59	92	14	117	21	142	20
18	30	43	12	68	30	93	15	118	42	143	40
19	10	44	6	69	43	94	15	119	2	144	14
20	11	45	9	70	68	95	17	120	14	146	8
21	29	46	15	71	46	96	31	121	12	147	6
22	16	47	47	72	18	97	41	122	13	149	14
23	13	48	41	73	27	98	34	123	3	151	4
24	9	45	38	74	15	99	27	124	10	153	2
25	27	50	27	75	21	100	20	125	17	154	2
26	20	51	22	76	18	101	15	126	17	155	6
27	20	52	27	77	9	102	10	127	3	156	2
28	25	53	33	78	22	103	14	128	23	157	5
29	20	54	10	79	26	104	10	129	11	159	2

$\gamma = (1.4230476E+02) + (-1.9070707E-02) \times x$
 $F = \text{SIGNIFICANCE OF } \gamma$
 $R = \text{SIGNIFICANCE OF } \alpha$
 $R^2 = \text{SIGNIFICANCE OF } \beta$
 $D = \text{DEGREES OF FREEDOM} = 3205$
 $N = \text{STORAGE CONDITIONS} = \text{AMB TEMP/RH}$ TEST CONDITIONS = 12 DEG. RISE/MIN

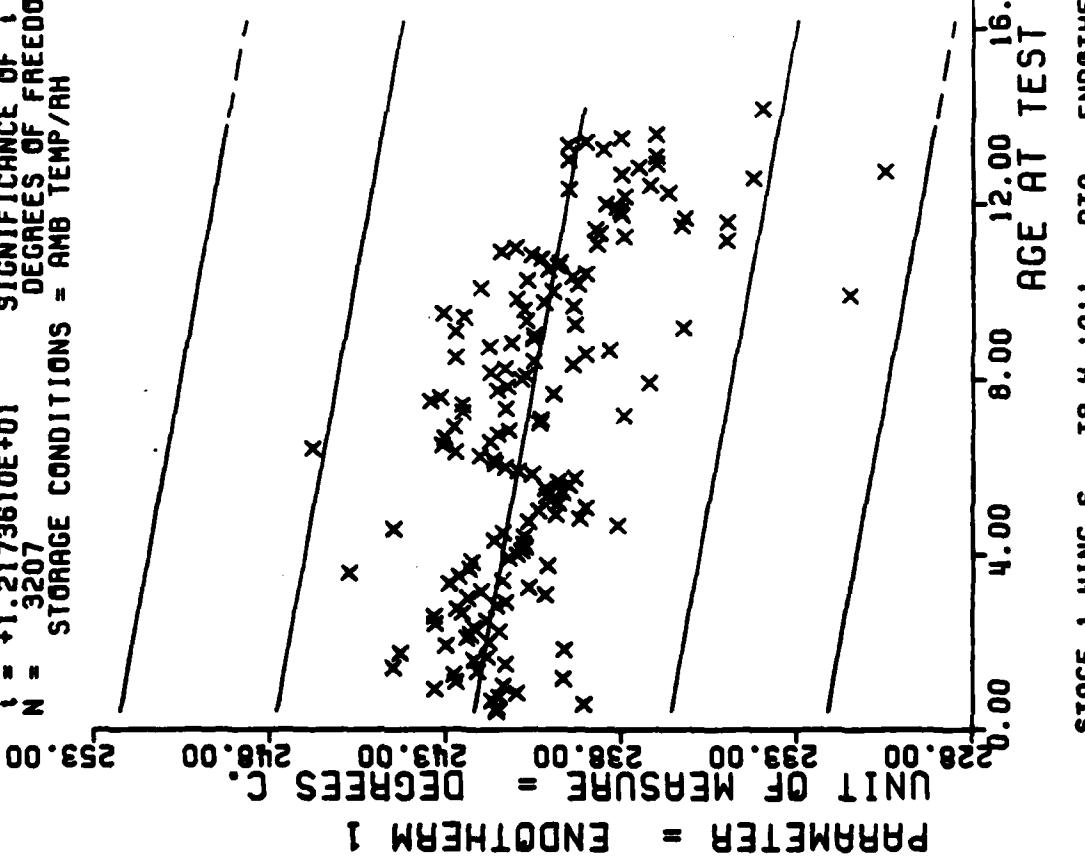


Figure 68

$\gamma = ((+3.0158646E+02) + (-6.1814723E-02) \times x) \times 10^{-6}$
 $F = 2.9969129E+02$ SIGNIFICANT OF F
 $R = -2.9288342E-01$ SIGNIFICANT OF R
 $I = +1.7311594E+01$ SIGNIFICANT OF I
 $N = 3196$ DEGREES OF FREEDOM = 3194
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG. RISE/MIN

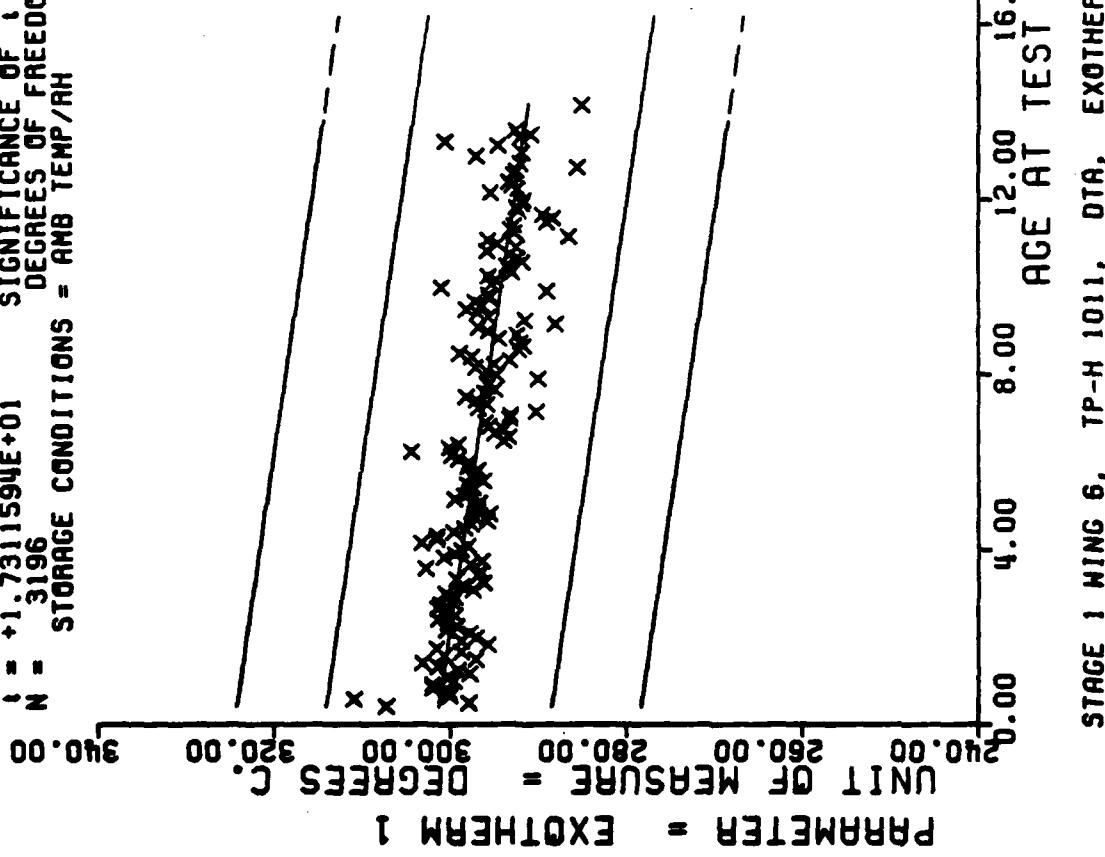


Figure 69

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NP SAMP	AGE (MOS)	NR SAMP	NP SAMP	AGE (MOS)	NP SAMP	AGE (MOS)	NR SAMP
8	3	34	26	59	29	84	16	109	13	134
9	5	35	21	60	42	85	16	110	4	135
10	3	36	29	61	34	86	15	111	6	136
12	17	37	19	62	28	87	17	112	9	137
13	10	38	7	63	36	88	18	113	35	138
14	9	39	18	64	16	89	32	114	57	139
15	5	40	19	65	22	90	31	115	29	140
16	22	41	5	66	24	91	13	116	7	141
17	14	42	11	67	48	92	13	117	20	142
18	18	43	10	68	26	93	14	118	41	143
19	4	44	4	69	29	94	14	119	2	144
20	11	45	9	70	56	95	9	120	10	145
21	22	46	9	71	47	96	28	121	12	147
22	13	47	42	72	15	97	33	122	13	149
23	19	48	31	73	16	98	32	123	3	151
24	9	49	30	74	14	99	25	124	9	153
25	20	50	17	75	17	100	16	125	17	154
26	16	51	14	76	16	101	14	126	16	155
27	12	52	18	77	9	102	10	127	3	156
28	19	53	25	78	21	103	17	128	19	157
29	18	54	9	79	26	104	9	129	16	159
30	22	55	15	80	34	105	7	130	50	160
31	21	56	30	81	33	106	15	131	37	161
32	22	57	25	82	30	107	2	132	22	162
33	11	58	27	83	26	108	12	133	14	163
									170	

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STAGE 1 WING 6, TP-H 1011, DTA, EXTHERM 2, 12 DEGREE CFNT GRAD, RISE/MIN

This sample size summary is applicable to figure 70

$y = ((+3.41389435 \times 10^2) + (-6.0979802 \times 10^{-2}) \times x)$
 $F = +3.6671182 \times 10^2$ SIGNIFICANCE OF F = $+6.4235162 \times 10^0$
 $R = -3.4773378 \times 10^1$ SIGNIFICANCE OF R = $+3.1843702 \times 10^{-3}$
 $t = +1.9149721 \times 10^1$ SIGNIFICANCE OF t = $+6.0237753 \times 10^0$
 $N = 2668$ DEGREES OF FREEDOM = 2666
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG. RISE/MIN

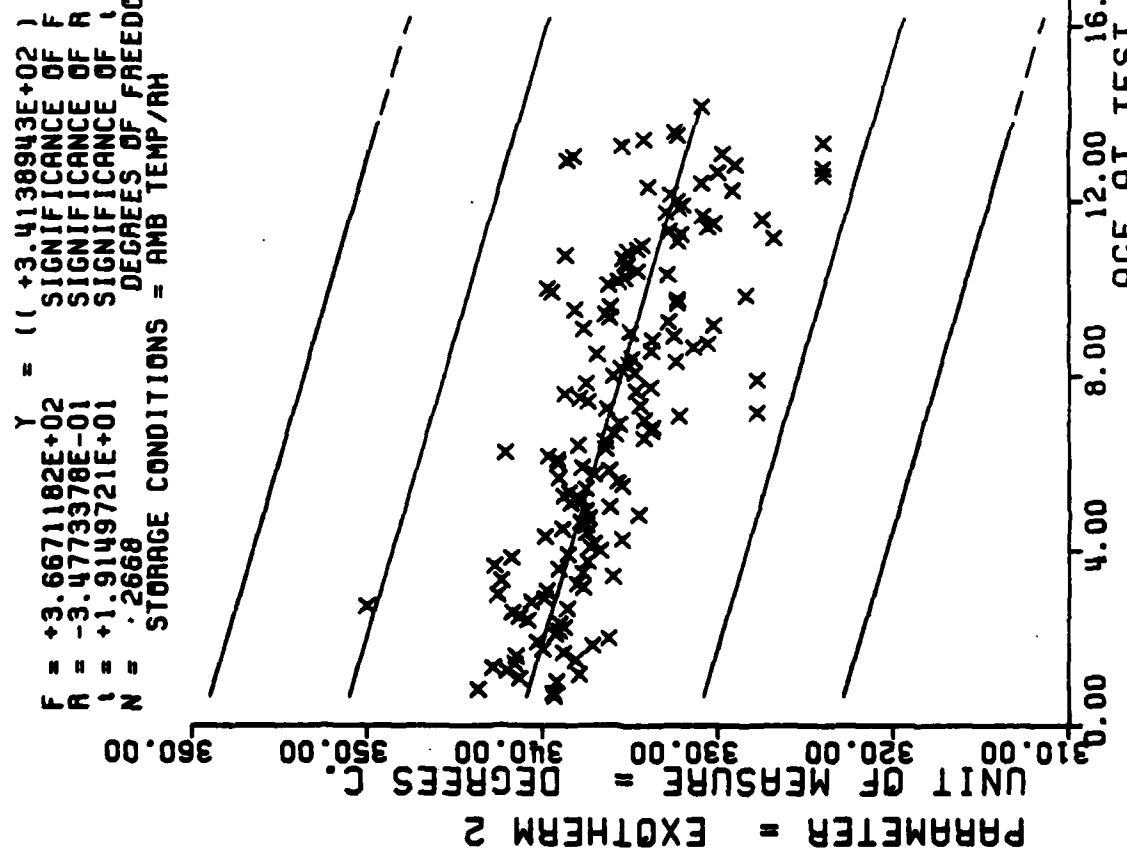


Figure 70

*** SAMPLE SIZE SUMMARY ***

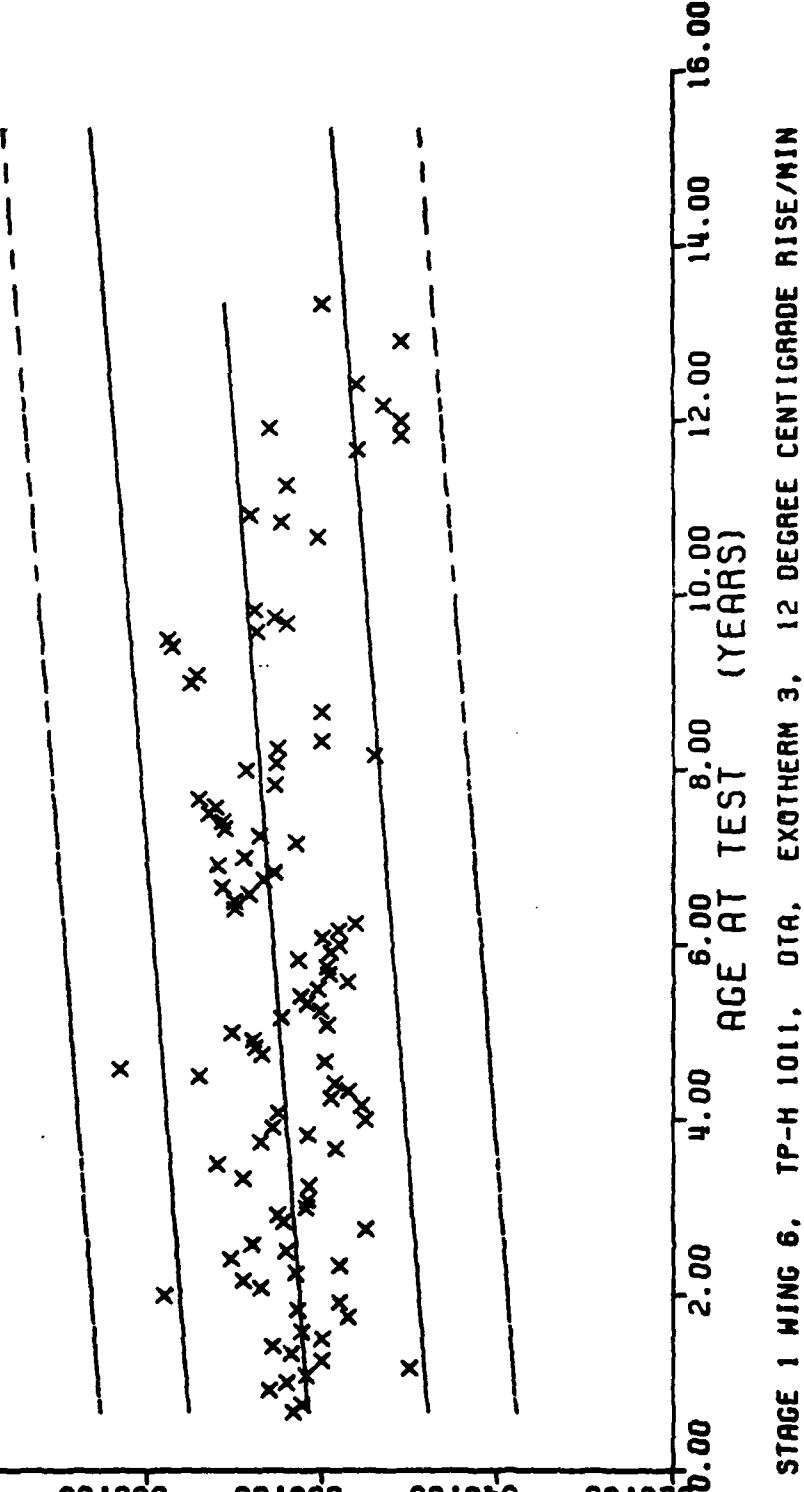
AGE (MOS)	NR SAMP								
8	3	36	4	64	4	91	6	144	1
9	7	37	5	65	7	92	2	146	1
11	3	39	2	66	4	94	3	149	1
12	4	40	5	67	9	96	6	155	1
13	5	42	3	68	4	97	4	160	1
14	3	44	2	69	7	98	1		
15	1	45	1	70	3	99	1		
16	4	46	5	71	2	100	1		
17	4	47	7	72	4	104	1		
18	5	48	8	73	4	108	3		
19	6	49	2	74	6	109	4		
21	6	50	2	75	6	110	1		
22	2	51	1	77	1	113	11		
23	4	52	3	78	3	114	21		
24	1	53	4	79	18	115	7		
25	1	54	1	80	12	116	2		
26	2	55	1	81	10	117	3		
27	4	56	3	H2	8	118	3		
28	5	57	7	H2	8	128	2		
29	5	58	5	H4	7	130	6		
30	6	59	7	H6	1	131	4		
31	6	60	4	H7	8	135	5		
33	6	61	7	H8	8	140	1		
34	5	62	6	H9	16	142	2		
35	5	63	5	90	12	143	4		

STAGE 1 WING 6. TP-H 1011. CTA. EXCITEW 3. 12 EFF EFF CENTIGRADE RISE/MIN

This sample size summary is applicable to figure 71

$F = +3.4875992E+01$ $\gamma = 1(+3.6107042E+02) + (+6.3001657E-02) \times X$
 $F = \text{SIGNIFICANCE OF }$ $F = \text{SIGNIFICANT}$
 $R = +2.6102427E-01$ $R = \text{SIGNIFICANCE OF }$
 $R = +5.9055899E+00$ $R = \text{SIGNIFICANT}$
 $t = 479$ $t = \text{SIGNIFICANT}$
 $N = 477$ $\text{DEGREES OF FREEDOM} = 477$
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG. RISE/MIN

UNIT OF MEASURE = DEGREES C.
 PARAMETER = EXOTHERM 3
 320.00 340.00 360.00 380.00 400.00 420.00



STAGE 1 WING 6, TP-H 1011, OTR, EXOTHERM 3, 12 DEGREE CENTIGRADE RISE/MIN

Figure 71

*** SAMPLE SIZE SUMMARY ***

AGEF (MOS)	NR SAMP								
5	9	31	25	56	29	81	25	106	12
6	27	32	23	57	21	82	22	107	4
7	11	35	15	58	36	83	22	108	11
8	11	34	28	59	26	84	13	109	9
9	5	35	21	60	39	85	20	110	3
10	3	36	28	61	33	86	15	111	6
12	20	37	18	62	27	87	13	112	10
13	19	36	9	63	42	88	13	113	29
14	17	35	20	64	20	89	16	114	37
15	7	47	16	65	23	90	23	115	27
16	23	41	5	66	26	91	9	116	8
17	10	42	8	67	48	92	12	117	19
18	25	43	11	68	25	93	15	118	39
19	6	44	5	69	34	94	13	119	2
20	2	45	7	70	67	95	10	120	14
21	12	46	10	71	46	96	25	121	12
22	7	47	40	72	18	97	33	122	13
23	12	48	31	73	27	98	32	123	3
24	8	45	35	74	15	99	20	124	10
25	26	57	23	75	20	100	19	125	17
26	18	51	23	76	18	101	15	126	17
27	16	52	24	77	9	102	8	127	3
28	22	53	31	78	19	103	17	128	21
29	15	54	11	79	9	104	8	129	11
30	20	55	15	80	23	105	5	130	58

STAGE: 1 WING 6, TR-H 1011, DTA, IGNITION TEMPERATURE, 12 DFGF-FF CFNT, RISF/MIN

163 170

This sample size summary is applicable to figure 72

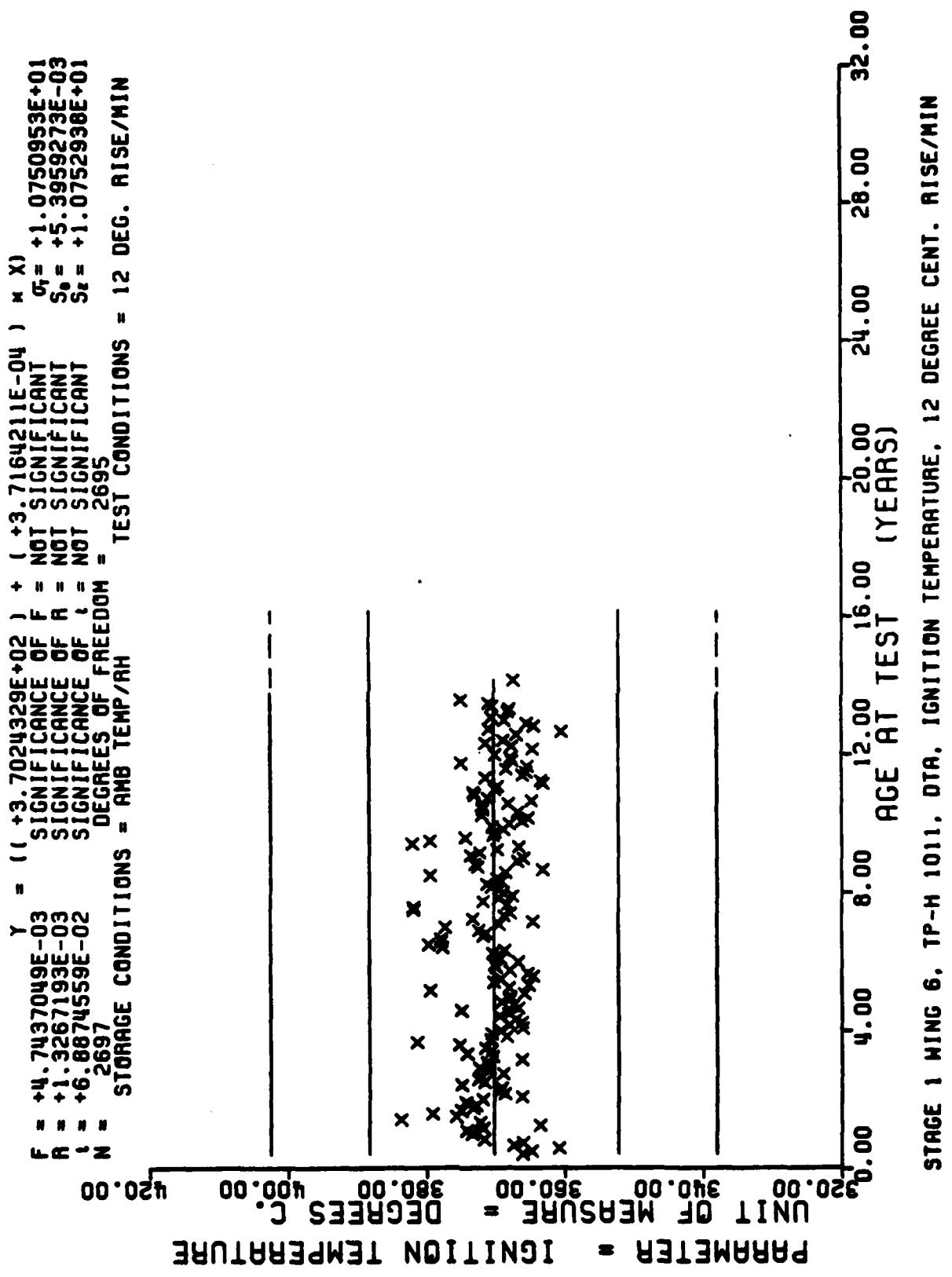


Figure 72

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGF (MOS)	NR SAMP								
1	2	40	33	70	33	95	21	121	27	146	36
15	3	41	6	71	25	96	24	122	21	147	12
16	9	42	19	72	54	97	24	123	9	149	9
17	15	45	3	73	50	98	35	124	5	150	9
18	12	47	9	74	74	99	36	125	6	151	9
19	12	51	12	75	69	100	22	126	12	152	6
20	16	51	12	76	36	101	8	127	22	154	6
21	3	52	22	77	21	102	18	128	12	155	3
22	3	53	24	78	8	103	6	129	39	156	3
24	3	54	26	79	39	104	9	130	54	157	3
25	3	55	24	80	15	105	9	131	86	158	6
26	8	56	17	81	34	107	6	132	24	159	3
27	24	57	27	82	24	108	6	133	17	162	2
28	27	58	45	83	15	109	5	134	15	162	3
29	46	55	42	84	9	110	3	135	24		
30	18	60	44	85	18	111	15	136	15		
31	42	61	33	86	12	112	14	137	9		
32	31	62	67	87	6	113	18	138	9		
33	43	63	51	88	15	114	54	139	50		
34	29	64	50	89	16	115	55	140	24		
35	43	65	37	90	28	116	22	141	27		
36	50	66	15	91	19	117	24	142	18		
37	24	67	24	92	26	118	28	143	12		
38	19	68	30	93	9	119	27	144	39		
39	21	69	27	94	6	120	79	145	27		

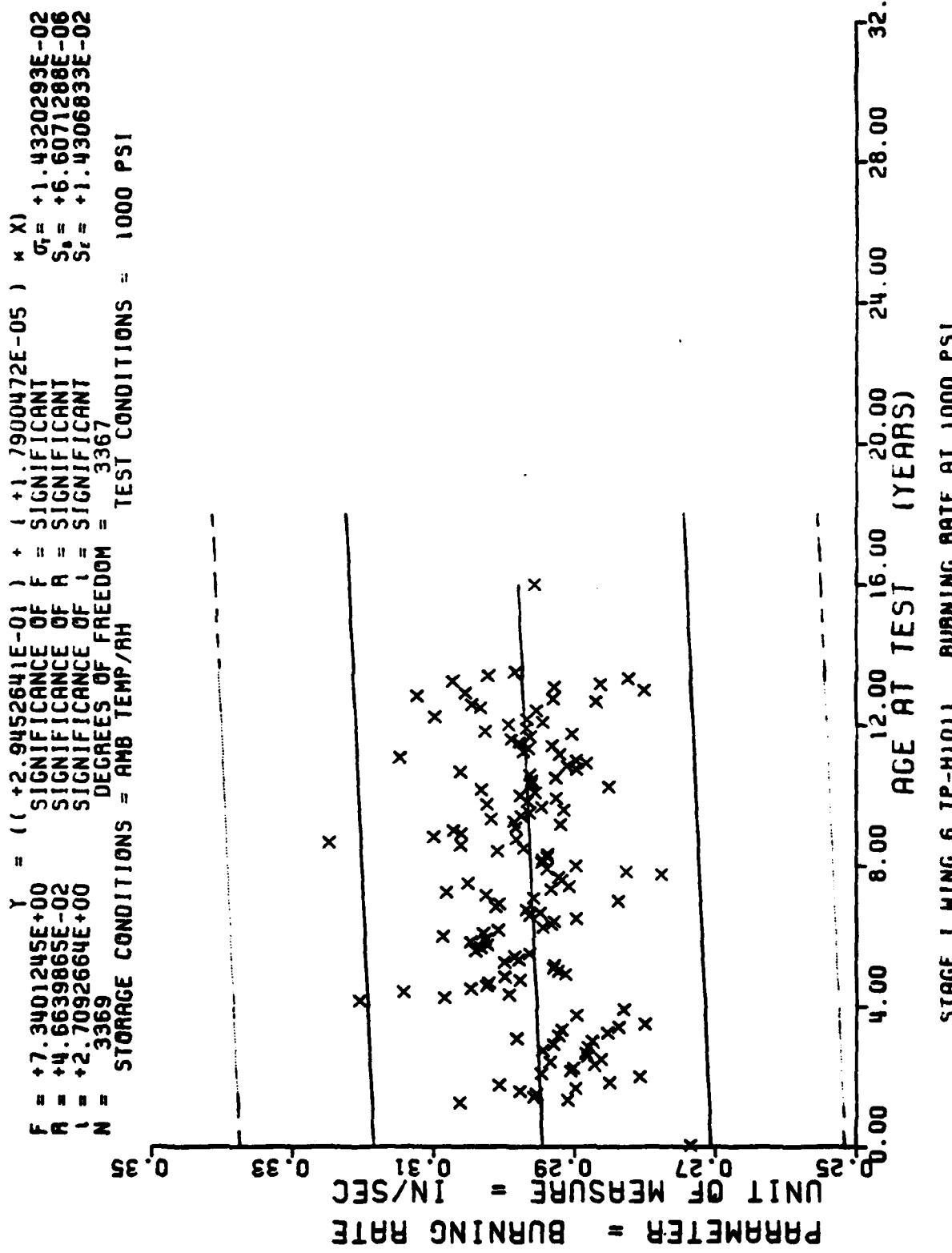


Figure 73

*** SAMPLE SIZE SUMMARY ***

AGF (MOS)	NP SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NP SAMP	AGF (MOS)	NP SAMP
28	6	71	17	98	14	128	2
30	3	72	16	99	18	131	8
32	2	73	21	100	8	132	54
34	2	74	11	101	5	133	5
35	3	75	14	102	6	136	2
36	7	76	20	103	3	14 ^a	2
37	3	78	31	104	7	141	2
39	6	79	42	105	8	144	2
41	3	80	56	106	4	145	2
42	3	81	42	107	7	146	2
46	3	82	32	108	3	147	2
52	3	83	59	110	3	148	2
53	3	84	3	111	34	149	2
54	3	86	5	112	13	150	2
55	3	87	2	113	6	152	2
59	10	88	6	114	13	154	2
60	18	89	2	115	23	155	2
61	21	90	3	116	14	156	5
62	15	91	15	117	6	157	2
63	5	92	5	118	44	159	2
64	3	93	6	119	22		
66	14	94	3	120	8		
67	54	95	5	122	6		
68	78	96	12	123	2		
69	36	97	6	125	2		

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STAGE 1 WING C POTENTIAL SCANNING CALORIMETER EXOTHERM 2 REAK TRIP

This sample size summary is applicable to figures 74 thru 76

$F = +8.9936583E+01$ $\gamma = (1.45.2045459E+02) + (1.1667973E-02) \times X$
 $R = -2.7354414E-01$ SIGNIFICANCE OF $F = \text{SIGNIFICANT}$ $\sigma_r = +2.0230013E+00$
 $I = +9.4834900E+00$ SIGNIFICANCE OF $R = \text{SIGNIFICANT}$ $S_o = +2.2848100E-03$
 $N = 1114$ SIGNIFICANCE OF $I = \text{SIGNIFICANT}$ $S_t = +1.9467177E+00$
 $\text{DEGREES OF FREEDOM} = 1112$
 $\text{STORAGE CONDITIONS} = \text{AMB TEMP/RH}$

$\text{PARAMETER} = \text{ENDOTHERM PEAK TEMP}$
 $\text{UNIT OF MEASURE} = \text{DEG K}$
 $508.00 \quad 512.00 \quad 516.00 \quad 520.00 \quad 524.00 \quad 528.00$

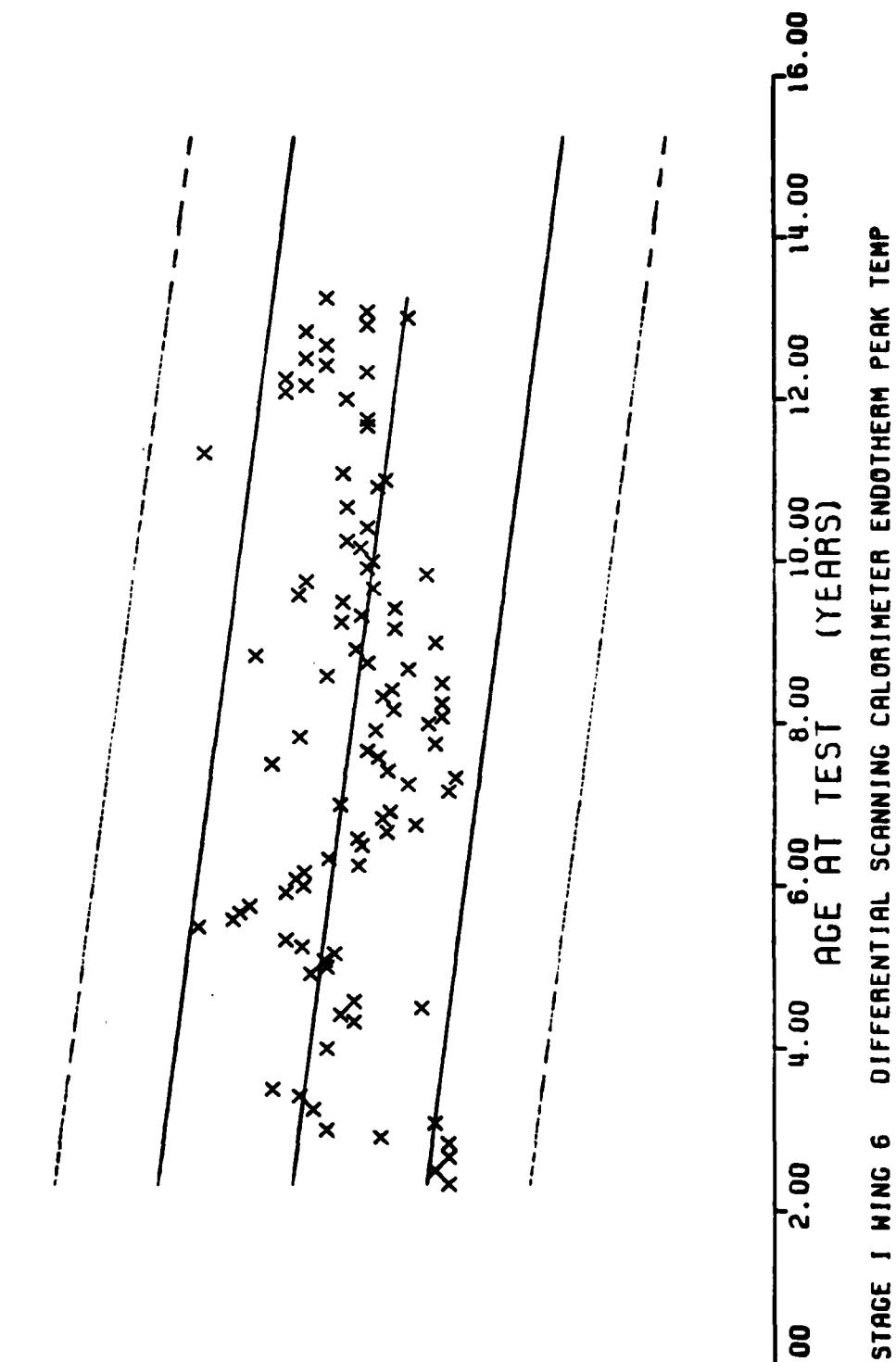


Figure 7b

$\gamma = (1.6008078E+02) + (-3.1491413E-02) \times x$
 $F = \text{SIGNIFICANCE OF } F = 1.1058653E+01$
 $R = \text{SIGNIFICANCE OF } R = 1.2950691E-02$
 $R^2 = \text{SIGNIFICANCE OF } R^2 = 1.1034326E+01$
 $N = 1114$
 $N^2 = 1112$
 $\text{STORAGE CONDITIONS} = \text{AMB TEMP/RH}$
 $\text{TEST CONDITIONS} = \text{AMB TEMP/RH}$

$\text{PARAMETER} = \text{EXOTHERM 1 PEAK TEMP}$
 $\text{UNIT OF MEASURE} = \text{DEG K}$
 $0.00 \quad 50.00 \quad 100.00 \quad 150.00 \quad 200.00 \quad 250.00$

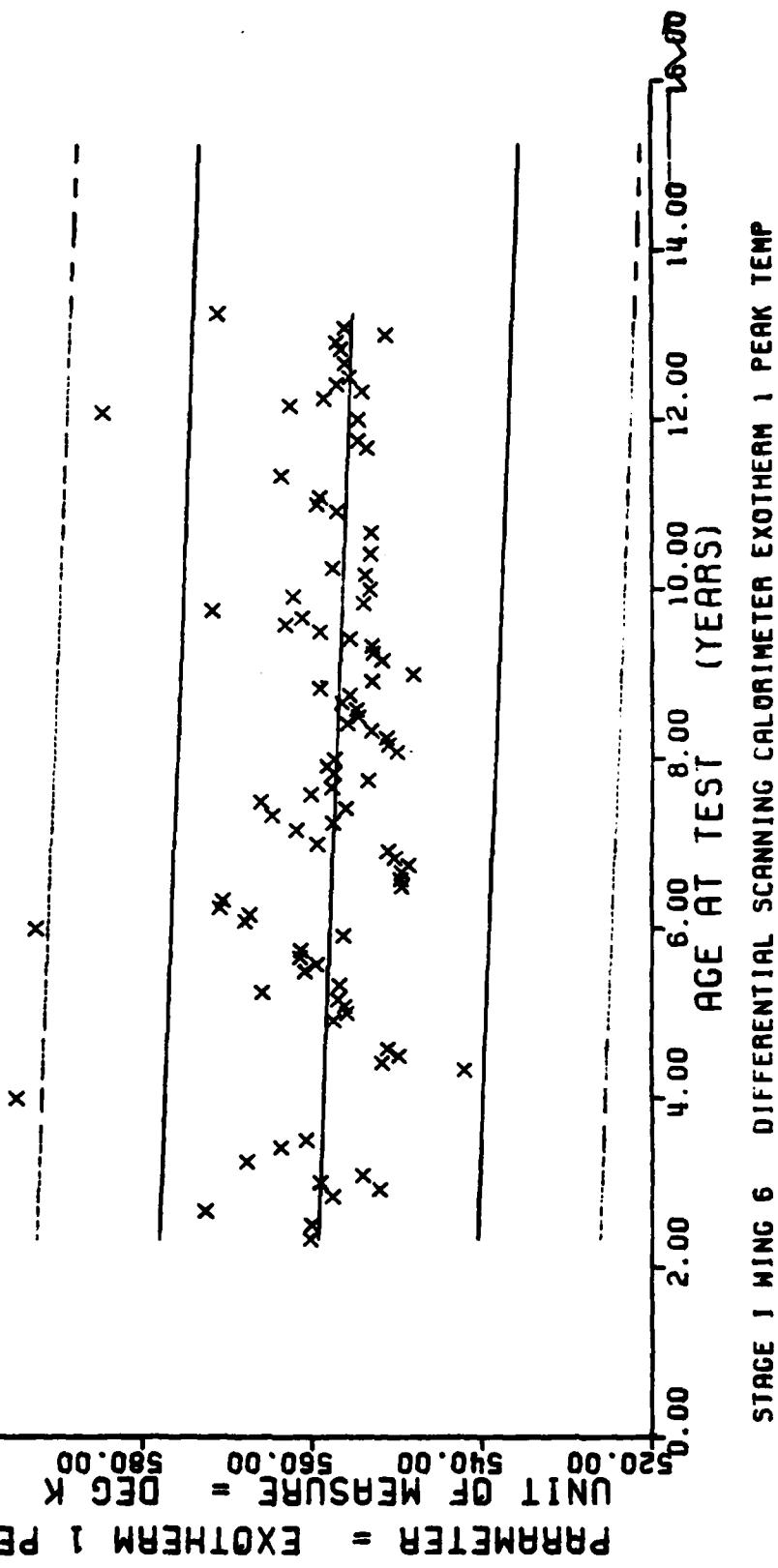
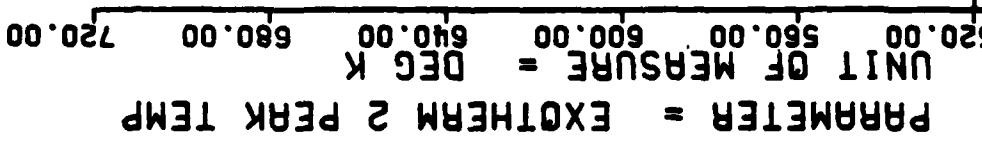


Figure 75

$\gamma = ((+6.1417125E+01) + (-9.4056431E-02) * x)$
 $F = +2.8729222E+01$ SIGNIFICANCE OF F = SIGNIFICANT
 $R = -1.58669770E-01$ SIGNIFICANCE OF R = SIGNIFICANT
 $\sigma_r = +5.3599647E+00$ SIGNIFICANCE OF σ_r = SIGNIFICANT
 $N = 1114$ DEGREES OF FREEDOM = 1112
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



STAGE I WING 6 DIFFERENTIAL SCANNING CALORIMETER EXOTHERM 2 PEAK TEMP

Figure 76

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6. AUTHOR John A. Thompson	7. CONTRACT OR GRANT NUMBER(s) 11 Oct 80	
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18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Solid Propellant Minuteman		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 F and G First Stage Minuteman Motors. This report uses a statistical approach to analyze the bulk carton propellant data. Testing was accomplished in accordance with MMWRM Project M04046-WNL01529.		
The data from this test period are combined with data from previous testing and entered into the GO85 computer for storage, analysis and regression analysis. From the statistical analysis of all data tested to date (fourteen & 1/4 years for		

F and G), significant degradation of the propellant does not appear likely for at least two years past the oldest data point.

Each point on the regression plot represents the mean of all samples at that particular age. The number of samples at each point is indicated on the sample size summary sheet on the page accompanying each regression plot or group of regression plots. The data range at any age can be found by suitable inquiry of the GO85 system.

